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Effect of Food Security and Federal Food Assistance Participation on Household Availability and Recorded Preschool Child Consumption of Sugar Sweetened Beverages and 100% Fruit Juice

Katherine A. Yarbrough
University of Connecticut - Storrs, katherine.yarbrough@gmail.com

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Katherine A. Yarbrough

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Presented by

Katherine Anne Yarbrough, B.A.

Major Advisor _____

Ann M. Ferris, PhD, RD

Associate Advisor _____

Robert H. Aseltine, Jr., PhD

Associate Advisor _____

Amy R. Mobley, PhD, RD

University of Connecticut

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ABSTRACT

Sugar sweetened beverage consumption is on the rise in the United States, particularly among children. However, the impact of household food security and federal food assistance participation on beverage habits has not been extensively analyzed. This paper sought to fill the current gap in literature on household beverage availability and recorded preschool child consumption of sugar sweetened beverages (SSB) and 100% fruit juice based on food security levels and status of federal food assistance participation. For this thesis, SSB are beverages that have added sugar and include fruit drinks, sodas, sports drinks, syrups, flavored milks, and teas. Baseline data from the Husky Byte project was used. Husky Byte was a three-year randomized, pretest-posttest control group study involving 471 primary caregivers of children aged 3-5 years at 24 daycare and preschool sites in Hartford County. Demographic information, household beverage inventory, food security data, and anthropometric measures were used from the Husky Byte program. Two-sample t-test and one-way ANOVA revealed that household availability of SSB and recorded child consumption of SSB was not associated with household food security or participation in federal food assistance programs. However, household food security was associated with more 100% fruit juice availability and SNAP participation was associated with increased reported preschool child consumption of 100% fruit juice. Further research is needed to more completely explore these differences.

CHAPTER I: INTRODUCTION AND LITERATURE REVIEW

Alarming Rates of Sugar Sweetened Beverage Consumption

Americans are consuming an alarming amount of sugar-sweetened beverages and 100% fruit juice.[1,2] In this paper sugar-sweetened beverages (SSB) are beverages that have added sugar and include fruit drinks, sodas, sports drinks, energy drinks, teas, syrups, and flavored milks.[2] From 1977 to 2001, SSB consumption in America increased 135% for all age groups from 2 to greater than 60 years old[1] and at present, SSB, specifically soda, energy drinks, and sports drinks are the main contributor of added sugar in the American diet.[1,2] According to the 2005-2006 National Health and Nutrition Examination Survey (NHANES), 28% and 19% of beverage calories of Americans 2 years old and older come from soda and 100% fruit juice and fruit drinks, respectively.[1,3,4] For adults 19 years or older, caloric intake from beverages in general increased from 236 calories per day in 1965 to 458 calories per day in 2002.[5] The first and third highest percentages of total beverage expenditures in the United States come from soda (40%) and fruit drinks(14%).[6]

Sugar sweetened beverage and 100% fruit juice consumption vary demographically among children and families. From 1988 to 2004 increased caloric intake from all SSB was greater among Black and Mexican American adolescents than white adolescents[2] but the consumption of high fat, high sugar milk (i.e.: flavored whole milk) increased the most among Non-Hispanic Whites.[7] Per capita consumption of fruit drinks and soda increased the most among Non-Hispanic Blacks from 1989 to 2008.[7] The greatest consumption of SSB and

100% fruit juice occurs in low-income families[2,8,9] and the consumption of 100% fruit juice among low-income children 2 to 11 years old increased and nearly reached similar consumption levels as children in higher-income families between 1988 to 2004.[2] Hispanic caregivers in California who had less than a high school degree were more likely to serve SSB and 100% juice to their children[10] and unemployed mothers and fathers in Minnesota who consequently have high work-life stress consume more SSB than fathers or mothers who work full time.[11] Unemployed parents were also less likely to encourage their children to eat healthily.[11]

The US Department of Health and Human Services targeted decreasing childhood consumption of SSB for its Healthy People goals because of the astounding amount of extra daily calories that come from beverages.[12] Children from 2 to 19 years old increased their daily caloric consumption of SSB and 100% fruit juice from 238 calories per day in 1988 to 271 calories per day in 2004[2] and now consume nearly 9 ounces of soda per day.[6] Consequently, milk consumption has decreased from 15 ounces in 1977 to 9 ounces in 2006.[6] Specific to children 6-11 years old, who have increased SSB daily caloric intake from 130 to 209 calories per day, fruit drinks and soda now contribute 118 calories to daily intake, up from 90 calories per day in 1989. Sports drinks and high fat, high sugar milk were next in contributing toward daily calories.[7] Of important note, from 1999 to 2004, preschool children increased their consumption of SSB from 13.2 fluid ounces to 15.5 fluid ounces per day and 100% fruit juice consumption from 9.9 to 11.1 ounces per day,[2] far exceeding the

American Academy of Pediatrics recommendations of no SSB and only 4 – 6 fluid ounces of 100% fruit juice per day.[13] The daily caloric intake from SSB among preschoolers increased from 150 calories to 176 calories per day from 1988 to 2004.[2] The SSB beverage of choice among preschool children is fruit punch, specifically,[2] which is not surpassed by soda until after children turn six years old.[6]

Consumption of SSB and overconsumption of 100% fruit juice among preschool children requires particular attention because this time period tends to be highly influential in forming habits.[14] While unhealthy habits in young childhood can continue into adulthood and eventually contribute to the onset of obesity,[15] there are some potential barriers impacting children's decisions. First, young children have a preference for accepting sweet and salty foods and rejecting bitter foods,[16] which could be a factor in preschool children's favor of fruit punch over water or milk. Second, children in this stage of life will eat what is in their environment and what they see others eating.[15] Therefore, what the caretaker makes available in the home, or the choices the caretaker makes regarding personal consumption of beverages, can influence a child's current and future beverage habits.

Food Insecurity and its Impact on Household Food Availability and Obesity

While a caretaker may know which foods and beverages they should feed their children, unhealthy choices, like SSB consumption, in low-income homes could be due to the perception, and reality in some situations, that healthier options are unaffordable. A household's economic situation, specifically food

insecurity, is a strong driver of food selection.[17] Food insecure households are concerned with whether or not they will have the ability to acquire and maintain a sufficient availability of nutritionally adequate food.[18] Food insecurity is closely tied to a household's financial status, as supported by the fact that food insecurity is twice as common in homes with children than in homes without children, and is highest among single women households with children.[19] Further, poverty predicts food insecurity[20] and individuals in poverty are 3.5 times more likely to experience the most severe form of food insecurity.[21] This financial uncertainty causes undue stress on a household, ultimately impacting food purchasing behavior and therefore household food availability.

Barriers to Healthy Food Choices in the Household

Although MyPlate guidelines for some fruits and vegetables can be met using the allocation for produce from the Thrifty Food Plan,[22] pre-grocery trip budgetary and meal planning is required[22] and some families may not have the resources – time or knowledge – to fulfill the required planning. Further, beyond budgeting knowledge, the perception that healthier foods are more expensive is a barrier worth consideration. As an example, the price, sometimes perceived, of "healthy" fruits and vegetables are a deterrent to low- and middle-income families[23] with 38% and 33% reporting that they did not purchase fresh fruits and fresh vegetables, respectively, because of their cost.[23] Only 30% of these families are satisfied with the price of "healthy groceries" and 26% do not purchase healthy items because they cannot afford them.[23] Though there is affordable produce, some "healthy" foods are, in reality, more expensive than

"less healthy" options. Whole grains and fresh and frozen dark, leafy vegetables are more expensive than refined grains and starchy vegetables[6,24,25] so individuals who experience economic issues are more likely to buy the cheaper, less healthy vegetables.[6,20] The green leafy vegetables in Hartford, Connecticut specifically are 23% more expensive than starchy vegetables.[6] Comparatively, fresh and frozen orange vegetables (e.g. carrots and sweet potatoes) are the same price as or less expensive than the less healthy starchy vegetables.[6] Pertaining to beverages, the price of bottled water is the same or less than the price of soda in all parts of the United States, excluding New York City.[6] Selection of soda over bottled water, demonstrates that, at times, individuals dedicate part of their shopping bill to unhealthy, rather than healthy, choices. However, the price difference between 100% fruit juice and fruit drinks is reality, not a perception. From 1998 to 2006, the cost of 100% fruit juice became 27% more expensive than fruit drinks,[6] which gives support to low-income families purchasing fruit drinks over 100% fruit juice due to the expense. Because food insecurity occurs when a household faces economic difficulties, the availability and quality of the food are restricted when families perceive that they cannot afford healthy options.[17] This can impact a family's diet due to restricted grocery purchase of fruits, vegetables, and beverages. Food insecure individuals consume fewer fruits, vegetables, or whole grains, but consume more meat, potatoes, sugar, and preservatives than high-income individuals.[26,27,28] Further, preschool children in food insecure homes have suboptimal health status compared to preschool children that are food secure.[29] The Institute of Medicine

states that food insecurity is correlated with poor dietary behavior and obesity.[30]

There is also a positive association between food insecurity, lower household income,[31] and obesity in adults,[32,33] particularly among low-income women.[32,34,35,36,37,38,39] Food insecure adults are nearly twice as likely to be obese than food secure adults[40] and food insecurity and obesity are linked to consumption of high calorie, high fat food.[25] Higher income households spend 27% more on food than low-income households[40] and while individuals who ate very healthy diets had a lower BMI, the group spent 3 times as much on fruits and vegetables than the group that ate less healthily.[27]

SNAP and its Association with Food Availability and Obesity

Financial concern of obtaining nutritionally adequate food can also be found within the SNAP population. Although individuals who self-select to receive SNAP are more food secure,[40] SNAP recipients are likely just as conscious of limited financial resources to feed their family. The similar perceived financial barriers among food insecure homes could manifest in SNAP households, perhaps because both situations are highly associated with each other.[32] In 2010, 59% of food insecure households in America received federal assistance for food.[40] Specifically in California, 29% and 23% of SNAP recipients reported high and very high food insecurity, respectively.[41] Nationally, a little more than 50% of SNAP households, 47% of households that receive free and reduced lunches, and 42% of houses that receive Supplemental Nutrition Assistance Program for Women Infants and Children (WIC) are food insecure.[42]

Limited financial resources among SNAP recipients elicit a different

response to food purchase than the response among food insecure individuals. SNAP money is usually distributed all at once, at the beginning of the month. SNAP recipients have demonstrated binging behaviors of shopping[34,43] and eating.[32] Food purchasing tends to peak at the beginning of the month but toward the end of the month, when there is heightened economic stress, food purchasing decreases.[34,43] This fluctuation in food availability causes some SNAP participants to binge eat when food is plentiful yet restrict when food is less accessible.[34] Repetitive behavior of this cycle has been linked to increased body fat[44] and therefore overweight and obesity.

Aside from the SNAP cycle, the costs of "healthy" options as a driver for nutrition behavior among low-income families could be a contributing factor to increased overweight and obesity trends in this population. Drenowski found that "as food costs diminish, dietary density rises, and total energy intakes may actually increase."[25] Consequently, a greater caloric intake and thus a higher body weight are more common among low income than high-income individuals.[45] Specifically, SNAP recipients drink more soda and consume less fruit than non-SNAP recipients[41] potentially suggesting SNAP recipients purchase lower cost food to stretch their food dollars. SNAP recipients also consume more meat, added sugars, and total fat;[34] however, the actual direction of the association has not been determined. Purchasing and therefore consuming low-cost, nutrient-poor food could be another avenue leading toward obesity among SNAP participants.

Parents as Gatekeepers

Unlike research on food security and adult obesity, studies on the relationship between food insecurity and childhood obesity have not been as conclusive.[46] However, studies show that parental behaviors impact children's eating habits. Food and beverage consumption among preschool aged children is contingent upon what parents make available and serve in the home.[47,48,49] A child's eating habits[50] and caloric intake[51] are established from habits set in the home and observation of parental eating behavior. An association between obesity among parents and greater consumption of sweetened beverages by preschool children also exists.[52] Low-income children may be at higher risk of overweight because of the relationship between food insecurity and the availability of and quality of food in the home, potentially leading to consumption of SSB. Overconsumption of SSB and 100% fruit juice may contribute to childhood overweight and obesity due to increased caloric intake. Children from low-income families might be at an increased risk.

Despite some studies showing that SSB do not lead to overweight in children,[53,54] the body of evidence supporting a relationship between SSB consumption and overweight or obesity is much stronger. These studies, including several meta-analyses, show consumption of SSB and over-consumption 100% fruit juice are positively associated with increased caloric intake.[2,7,55,56,57] Additionally, some meta-analyses point to an association between beverage consumption and overweight or obesity. A meta-analysis of 88 research studies found a clear association between soda intake and

increased body weight.[58] Another meta-analysis of 30 studies from 1966 to 2005 found that increased SSB consumption was positively related to weight gain and obesity in children.[59] One meta-analysis[60] also found a positive association between increased SSB consumption and weight gain, increased BMI, and obesity. Among low-income preschool children, consumption of SSB was positively associated with being overweight and consumption of just one to two SSB per day among preschool children who were at risk of becoming overweight were 1.9 times more likely to become overweight within the one year study period.[57] Conclusions regarding the direct relationship between SSB and 100% fruit juice consumption and obesity is unknown, but it is clear that consumption of SSB and overconsumption of 100% fruit juice add extra calories.

The cost of "healthy" food as a deterrent of food insecure households to purchase healthy food could also impact beverage purchase. Some SSB are less expensive than the healthier options, so food insecure homes may be more likely to purchase lower priced beverages. Consequently, these less healthy beverages are then likely to be consumed by the preschool child in the home. While federal food and nutritional assistance programs increase food security,[40] they do not eliminate the number of households that experience food insecurity. Families that participate in food assistance programs could be facing the same barriers to purchasing healthier options. However, families that receive SNAP are more likely to purchase low cost, calorie dense foods.[25] Caregivers with WIC are restricted to purchase healthy options such as whole grains, low fat dairy products, and fruits and vegetables with their funds but individuals that receive

SNAP have fewer restrictions for what they buy, none of which restrict certain beverage purchases(SNAP). Because fruit drinks are less expensive than 100% fruit juice, and because WIC, but not SNAP, prohibits SSB purchases, it seems reasonable that SNAP recipients would purchase more SSB than WIC recipients.

Prior research mostly compares food insecurity to food, not beverage, availability and quality. This project aims to fill the literature gap by examining whether availability of and consumption of sugar sweetened beverages and overconsumption of 100% fruit juice is affected by food security level and federal food and nutrition assistance program participation. The following chapters respond to the following research questions:

- **Research Question 1:** Does the availability of and consumption of SSB and 100% fruit juice among preschool children differ between food secure and food insecure households?

- **Research Question 2:** Does the availability of and consumption of SSB and 100% fruit juice among preschool children differ among WIC, SNAP, and non-federal food assistance program recipients?

Because the cost of some SSB is less expensive than other healthier beverage options, it seems likely that SNAP homes would be more likely to purchase lower priced beverages. Consequently, these less healthy beverages are then likely to be consumed by the preschool child in the home. However, because 100% fruit juice is more expensive than SSB and because the WIC package makes 100% fruit juice available to families, it is likely that availability

and consumption of 100% fruit juice would be higher in food secure and WIC households, measured independently. Therefore, I hypothesized that SSB will be more available in the household and preschool child per day consumption will be higher in food insecure homes and homes that participate in SNAP. It is also hypothesized that 100% fruit juice, not SSB, will be more available in food secure homes and homes that participate in WIC.

CHAPTER II: METHODOLOGY

Study Design

This analysis uses cross-sectional, baseline data from the Husky Byte project, conducted by the University of Connecticut Center for Public Health and Health Policy, which was a three-year randomized, pretest-posttest control group study[52] involving 471 primary caregivers of children aged 3-5 years at 24 daycare and preschool sites in Hartford County. Sixteen of the schools were located in Hartford, five schools in East Hartford, two schools in New Britain, and one school in Middletown. The project team recruited sites that served low-income children and had at least two classrooms. Sites were randomly assigned to either a 10-week SSB education treatment or sham food safety control education. During each study period (i.e.: Fall 2009, Spring 2010, Summer 2010, etc.) the number of control and intervention sites was divided equally, and by the end of the study 12 sites were intervention sites and 12 sites were control sites. The target recruitment number was based on the power calculation for the hypothesis of the larger study.

Undergraduate University of Connecticut students taught the sweetened beverage consumption and food safety curriculum using interactive display boards, which included activities, incentives, and handouts.

Sample

Recruitment of primary caretakers for participation in the Husky Byte project began at least 2 weeks prior to the 10-week educational intervention and

occurred during drop-off and pick-up times at the preschool. During the pilot in Fall 2009, 10 or fewer primary caretakers were recruited at each of the two sites designated for that study period. Recruitment numbers increased substantially when true implementation began in the spring of 2010. At least 23 primary caretakers were recruited to participate at each site except for at sites with a smaller student population, from which at least 12 participants were recruited. When possible, participants were over-recruited in order to ensure at least a 75% follow-up retention.[61,62] Participation criteria required that the participant be the primary caretaker of the preschool child.

Data Collection and Study Instruments

The University of Connecticut Health Center Institutional Review Board approved the protocol for this study. Participants completed identical 45 – 60 minute surveys during three interview phases: at baseline, at one week post-intervention, and three months post-intervention. Prior to starting the baseline interview, participants provided written consent for participation. Interviews, conducted by Husky Byte researchers, occurred at the child's preschool or the participant's home or place of work. To encourage retention, participants received $15 after completing the baseline interview and then $20 after each follow-up data collection. This thesis uses baseline data only.

Researchers collected data using a demographic survey, an instrument based on the Information-Motivation-Behavior Skills behavior change model,[62] Parental Attitudes Toward Nutrition and Child Health Questionnaire, USDA Food Security Module,[34] Home Beverage Inventory, 48 hour preschool food recall, and

caretaker and preschool child anthropometric measurements. This analysis will use data from the demographic questionnaire, USDA Food Security module, Home Beverage Inventory, and the anthropometric measurements (Appendix B).

Demographic Survey

Relevant demographic data for this analysis included year of birth and gender of the caregiver and preschool child participant, number of adults and children in the household, race and ethnicity, educational attainment, employment status, living situation, type of health insurance, and participation status of the caregiver in the SNAP and/or WIC program. The demographic survey is located in Appendix B.

Food Security Measurement

Household food security was measured using the 18 question USDA Food Security Module[34] (Appendix B) which asks questions about the household's experience with the ability to feed their family over the past 12 months (Appendix B). Questions 2-4 and 8-12a assess food security of the household and adults in the house; questions 5-7 and 13-16 assess food conditions of the children in the household, if applicable. Participant's responses to the 18 questions determine food security status. Households are considered food secure if they respond to zero, one, or two food insecure conditions and are considered food insecure if they respond affirmatively to three or more food insecure conditions.[31] Affirmative food insecure responses include answering "often true" or "sometimes true" to questions 2-7, "almost every month" and "some months but not every month" to questions 8a, 12a, and 14a, and "yes" to the remaining questions.

Food insecurity is then broken down into low and very low food security. Very low food security in households that do not have children responded affirmatively to six or more food insecure conditions. Very low food security in households with children responded affirmatively to 8 or more food insecure conditions. Very low food security among children is identified if the participant responds to 5 out of the 8 questions about child food security, questions 5-7 and 13-16.

For this project, food insecurity was measured and analyzed in the four security levels according to USDA methodology: high food security, marginal food security, low food security, and very low food security[31] and as a dichotomous variable of food secure or food insecure.[64] Although the USDA categorizes marginal food secure homes as being food secure, children experience adverse health effects[64] and increased added sugar intake[65] from living in marginally food secure homes. Potential associations of beverage habits might be lost if marginally food secure homes were only classified as food secure, so this analysis looks at the two different food secure dichotomous variables: food secure and insecure according to USDA methodology and food secure and insecure with marginally food secure grouped with food insecurity. Food security was analyzed categorically rather than continuously based on standard analysis of food security.[31]

Home Beverage Inventory

Interviewers led participants through the Home Beverage Inventory (HBI) and recorded all the non-alcoholic beverages in the participant's house including liquids, powders, concentrates, tea, coffee, and syrups (Appendix B). The

interviewer also recorded the beverage name, type of beverage (i.e.: 100% fruit juice, soda), flavor, size of the container, number of containers in the home, and the frequency and amount consumed by the preschool child. To indicate frequency, participants estimated how many times per day, per week, per month, or per year the study preschool child drank each individual beverage. Amount consumed in ounces was estimated using three cups, a 5 ounce, 8 ounce and 12 ounce cup, which each participant received at the beginning of the interview. Participants indicated which cup best represented the study child's cup at home and indicated to what point liquid filled the glass for each beverage.

Beverage Categorization

For data analysis of the HBI, beverages were categorized as 20 individual beverage groups based on their ingredients and the USDA Food and Nutrient Database for Dietary Studies[66] (Table 1). For purposes of this study, beverages from those twenty categories were aggregated to create SSB and 100% fruit juice categories. Sugar sweetened beverages are any fluid ounce beverage, including flavored milk, that has added sugar or a combination of added real and artificial sugar. Juice is considered 100% fruit juice if the beverage is pure fruit juice with no added sugar. For this study, diluted 100% fruit juice and low calorie 100% fruit juice are considered 100% fruit juice because according to the ingredient label, the diluted 100% fruit juice is 100% fruit juce diluted with water and low calorie 100% fruit juice is 100% fruit juice diluted with water and with added artificial sugar.

Table 1. Individual and aggregate beverage categories used for this thesis.

	Aggregate Drink Categories		
All Beverage Categories from Home Beverage Inventory	**Sugar Sweetened Beverages**	**100% Fruit Juice**	**Excluded Beverages**
Flavored milk (chocolate/strawberry milk)	**x**		
Juice drinks dry mix/powder, converted to fluid ounces	**x**		
Juice drinks, punches, nectar, lemonade - Fluid	**x**		
Iced tea fluid - sweetened w/sugar	**x**		
Iced tea powder sweetened w/sugar	**x**		
Syrups (chocolate, strawberry)	**x**		
Energy drinks (Gatorade, Powerade)	**x**		
Soda regular	**x**		
100% juice		**x**	
Diluted 100% juice		**x**	
Low calorie 100% juice beverages		**x**	
Milk not flavored			**x**
Chocolate powder, hot cocoa, Milo, Nesquick			**x**
Coffee, tea			**x**
Soy milk, almond milk, goat milk			**x**
Soda diet			**x**
Nutritional supplements (Pediasure, Ensure)			**x**
Water, flavored water no sugar added, seltzer water			**x**
Tap/fountain water			**x**
Pancake Syrup and Honey			**x**

Calories and grams sugar per serving for every individual beverage represented on the HBI were collected and entered into the HBI database in Microsoft Access®. Calories and grams sugar per serving were found using the beverage nutrition label accessible from the manufacture's website. If nutrition information was not available from the manufacturer's website, nutrition label databases were used. The three nutrition facts databases used were www.myfitnesspal.com, www.caloriecount.com, and www.livestrong.com. These databases were used to ensure consistency in listed calories and sugar per serving. MyFitnessPal was used first, and was compared to CalorieCount.com.

If the calories and sugar per serving size were correct, that information was used. If data between the two databases was conflicting, Livestrong.com was used. Data that matched Livestrong.com was used. There were no cases where two databases did not match up, so no further steps were necessary. Calories and grams sugar per serving were converted to a consistent unit of kcal/ounce and grams/ounce. Assumptions made to complete missing data of beverage flavor, size of the container, and amount of sugar and calories are shown in Table A1.

Anthropometric Measure

The preschool child and adult caregiver were asked to remove shoes and heavy jackets or sweaters prior to weight and height measurement. The interviewer recorded whether or not the caregiver and child removed these clothing items and measures were adjusted if items were not removed. Height was measured using the Frankfurt Protocol (Figure A1).[67] The child stood straight up with should relaxed and arms at the side. The child's knees were together and feet were flat on the ground. The child's shoulder blades, buttocks, and heels were touching the wall. The child looked straight ahead at a fixed point. Three separate times the interviewer marked the child's height using a pencil and then measured to the nearest 0.0625 inch using a tape measure. Weight was measured three times using an electronic self-calibrating digital scale (Physicians Remote Digital Scale) also using standard procedures.[67] Height and weight data were converted to Body Mass Index (BMI) data. Body Mass Index (BMI) was calculated using the averaged height and weight of the caregiver and preschool child and the Centers for Disease Control and Prevention (CDC) BMI

Standards(CDC reference). Caregiver BMI was categorized using the CDC standards of underweight (BMI<18.5), normal weight (BMI≥18.5 but <25), overweight (BMI≥25 but <30), and obese (BMI≥30)[68]. Body Mass Index categorization for the preschool child participants followed the age- and gender-specific CDC Reference Standards for underweight (BMI<5th percentile), normal weight (BMI≥5th but <85th percentile), overweight (BMI ≥ 85th but <95th percentile), and obese (BMI ≥ 95th percentile).[69]

Data Analysis

Analyses for this study were conducted using SPSS, version 17.0. Primary exploration of consumption data showed that consumption data for SSB and 100% fruit juice had extreme outliers and were positively skewed (Table A2, Appendix A). To correct this, extreme outliers were removed from the data by trimming nine participants from both ends of the data resulting in a 4% trim. To further normalize data before running the ANOVAs, an integer of one was added to availability and log transformation improved the symmetry of the distributions of all outcomes. Comparison of the data pre- and post-log transformation can be found in Appendix A (Table A3 and Table A4); additionally, stem and leaf plots of pre- and post- log transformation data are included in Appendix A (Figures A1 – A4).

Dependent variables were beverage availability, of SSB and 100% fruit juice, in the home and total consumption per day in ounces of SSB and 100% fruit juice. Key independent variables were food security level and WIC and/or SNAP participation. Food security was categorized three different ways using the

continuous food security participant responses: categorically following USDA standard of including marginal food security as “food secure”, categorically excluding marginal food security from “food secure”, and as four categories: high food security, marginal food security, low food security, and very low food security. Variables for SNAP and WIC included whether or not the participant receives SNAP benefits, whether or not the participant receives WIC benefits, and from this data the variable “food assistance participation” was created which included “no federal food assistance participation”, “participation only in SNAP”, “participation only in WIC”, and “participation in both SNAP and WIC”.

Two-sample t-tests were used for bivariate analyses and one way ANOVA was used for multiple group comparisons. To analyze statistical differences in availability and consumption across more than two groups, homogeneity of variance was assessed using Lavene’s test. If homogeneity of variance assumptions were met, one-way ANOVA was used. When the ANOVA resulted in significant differences between the means ($p<.05$) the Bonferroni method was used to identify where the group differences existed. If the homogeneity of variance assumptions were not met, means were compared using the Kruskal-Wallis test. If significant differences were found from the Kruskal-Wallis test, the Tamhane’s T2 method was used to assess differences between the means.

CHAPTER III: RESULTS

Preschool Child and Caretaker Demographics

A total sample of 471 caretakers and their respective preschool children participated in the Husky Byte program at baseline. The average age of the preschool children was 4 years old, ranging from 2.7 to 5.8 years, and over half (53%) were male (Table 2). Nineteen percent of children were overweight and 14% were obese, for a combined total of 33% of children being either overweight or obese.

Table 2: Characteristics of preschool children.

Child Characteristics	n	%
Total Participants	471	100
Age		
2	11	2
3	161	34
4	221	47
5	60	13
Sex		
Male	249	53
BMI[a], weight class		
Underweight	12	3
Normal	284	60
Overweight	88	19
Obese	64	14

[a]BMI = Body Mass Index

Caretakers were primarily women (89%), Black (44%) or Latino (34%), and ranged in age from 16 to 62, with an average age of 31 (Table 3). Forty-seven percent of caretakers were single, 90% had at least a high school diploma,

and nearly half (47%) of the caretakers worked full-time. Seventy-three percent of caretakers were overweight or obese, with 41% being obese.

Table 3: Characteristics of the primary caretakers.

Caregiver Characteristics	n	%
Total Participants	471	100
Sex		
Female	420	89
Ethnicity		
African American/Black	211	44
Latino	158	34
White	78	17
Other	23	5
Living Situation		
Single	222	47
Partnered/married	209	44
Separated/divorced	39	8
Education		
Less than High School Diploma	46	10
At least a High School Diploma	425	90
Employment Status		
Full-time	221	47
Part-time	107	23
Unemployed	143	30
BMI[a], weight class		
Underweight	4	1
Normal	98	21
Overweight	152	32
Obese	192	41

[a]BMI = Body Mass Index

Household Characteristics

Twenty-six percent of households met the USDA standard for food insecure. Household food insecurity jumps to 45% when marginal food security is included in food insecurity, with 19% of households marginally food secure

(Table 4). Forty-five percent of households received SNAP benefits at the point of the interview and 35% of households received WIC benefits at the point of the interview; within the 45% and the 35% are participants that could have received only SNAP or only WIC or both. Twenty-four percent of households received benefits from SNAP and WIC.

Table 4: Household characteristics.

Household Characteristics	n	%
Total Participants	471	100
Food Security, USDA Standard[a]		
Food Secure	342	73
Food Insecure	122	26
Food Security Levels		
High Food Security	254	54
Marginal Food Security	88	19
Low Food Security	99	21
Very Low Food Security	23	5
Food Security, inclusion of marginal security[b]		
Food Secure	254	54
Food Insecure	210	45
Currently Receive SNAP benefits[c]		
Yes	210	45
Currently Receive WIC benefits[d]		
Yes	164	35
Food Assistance Participation		
No participation	174	43
SNAP	83	21
WIC	43	11
Both SNAP and WIC	98	24
Household Beverage Availability		
Participants with SSB	403	86
Participants with 100% fruit juice	377	80
Number of Adults		
1-2	398	85
3-4	44	10
5-7	8	1
Number of Children		
1-2	313	67
3-4	118	25
5-7	8	1
Average Household Size (SD)	3.8 (1.3)	

[a]USDA Standard[31]

[b]"Food insecure" includes marginal food security[64]

[c]Participants are combined of those that only participate in SNAP and those that participate in both SNAP and WIC

[d]Participants are combined of those that only participate in WIC and those that participate in both WIC and SNAP

Household Beverage Availability and Recorded Child Consumption

Eighty-six percent of households had SSB available and 80% of homes had 100% fruit juice available (Table 4). Average household availability of SSB was 541 fluid ounces (±796.10), equivalent to nearly four and a half gallons of SSB (Table 6). Average 100% fruit juice availability was 220 fluid ounces (±234.40), or nearly 2 gallons. On average, children drank 12 fluid ounces (±15.00) of SSB per day and 14 (±13.60) fluid ounces of 100% fruit juice per day (Table 7).

Association of Household Availability and Recorded Preschool Child Consumption with Food Security and Federal Food Assistance Programs

Availability Household availability of SSB was not associated with household food security or participation in either the SNAP or WIC programs (Table 5). Household availability of 100% fruit juice was associated with food security but not participation in SNAP or WIC (Table 6). Food secure homes, whether measured by the USDA standard method or with the exclusion of marginally food secure homes, had a higher inventory of 100% fruit juice (232.80 ± 219.31 oz) than food insecure households (182.58 ± 276.59 oz, p=0.002). Analysis of the four household food security levels using the Tamhane's T2 method, which assumes unequal homogeneity of variance for this particular comparison, showed significantly greater household availability of 100% fruit juice in high food security households (243.57 ±234.57 oz) compared to low food security households (189.82 ±302.13 oz, p=0.03) (Table 7).

Consumption Reported child consumption of SSB was not associated with household food security or participation in the WIC program, but was approaching significance when comparing SNAP to non-SNAP participants, p=0.059 (Table 5). However, caloric intake (p=0.008) and sugar intake (p=0.009) per day from SSB was associated with SNAP participation. Children in SNAP households consumed 174.39 ± 160.10 kcal per day and 42.08 ± 40.08 grams of sugar, or 10.5 teaspoons of sugar, per day from SSB compared to children in non-SNAP homes that consumed 127.07 ± 135.08 calories per day and 29.80 ± 31.38 grams of sugar, or 7.5 teaspoons of sugar, per day from SSB, .

Recorded child consumption of 100% fruit juice was not associated with household food security or WIC participation but was associated with SNAP participation (Table 6). Children in SNAP households drank three fluid ounces more per day of 100% fruit juice than children in homes that do not participate in SNAP; a mean of 16.58 ± 10.48 ounces per day versus 11.50 ± 10.48 ounces per day, p=0.006. Children in SNAP households ingested an average of 41 kcal per day (p=0.049) and 9 grams of sugar per day (p=0.032) more from 100% fruit juice than children in non-SNAP homes. Multiple comparison analysis using the Bonferroni method confirmed that children in SNAP households consumed more 100% fruit juice (p=0.01) and had higher intakes of calories (p=0.04) and sugar per day (p=0.04) from 100% fruit juice when compared to children in homes that do not receive federal food assistance.

Table 5: Sugar sweetened beverage (SSB)[a] average household availability and child consumption by household food program and food security (trimmed data)[b]

	Household Availability		Child Per Day Consumption	Calories per day from SSB	Sugar per day from SSB
	n	mean (SD[c])	mean (SD)	mean (SD)	mean (SD)
		fluid oz	fluid oz	kcal	g
Overall	403	540.9 (769.1)	12.4 (15.0)	148.50 (148.50)	35.30 (36.00)
Food Security, USDA Standard					
Secure	292	505.53 (242.13)	12.26 (14.72)	145.80 (146.87)	34.97 (36.08)
Insecure	106	651.23 (1050.19)	13.07 (15.92)	156.13 (155.29)	36.47 (36.40)
Food Security, food insecure excludes marginally food secure					
Secure	216	527.29 (692.73)	12.06 (14.75)	141.75 (143.29)	34.08 (36.06)
Insecure	182	564.55 (860.00)	12.98 (15.39)	156.65 (155.60)	36.90 (36.25)
Food Secure Levels[g]					
High food security	216	527.29 (692.73)	12.06 (14.75)	141.75 (143.29)	34.08 (36.06)
Marginal Food Security	76	443.66 (464.16)	12.84 (14.72)	157.40 (157.21)	37.53 (36.28)
Low Food Security	86	715.06 (1136.06)	12.11 (12.81)	151.42 (146.18)	34.52 (33.33)
Very Low Food Security	20	376.75 (472.59)	17.23 (25.38)	175.73 (191.97)	44.57 (47.33)
Currently Participate in SNAP[e]					
Yes	182	611.43 (896.98)	14.6 (16.34)	174.39* (160.10)	42.08* (40.08)
No	217	479.68 (639.86)	10.66 (13.60)	127.07 (135.08)	29.80 (31.38)
Currently Participate in WIC[e]					
Yes	142	518.04 (676.36)	12.56 (15.19)	157.20 (152.26)	36.32 (35.08)
No	259	555.14 (818.75)	12.39 (14.90)	144.61 (146.92)	34.98 (36.60)
Food Assistance Participation					
No participation	174	504.66 (672.15)	10.74 (13.90)	123.71 (126.58)	29.35 (30.15)
Participate in only SNAP	83	666.12 (1066.29)	15.69 (16.49)	186.18 (176.22)	46.47 (45.81)
Participate in only WIC	43	378.52 (481.22)	10.31 (12.25)	141.11 (167.30)	31.70 (36.46)
Participate in both SNAP and WIC	98	565.65 (731.74)	13.62 (16.33)	165.16 (146.31)	38.52 (34.62)

[a] Sugar sweetened beverages are any fluid ounce beverage that have added real or artificial sugar
[b] Group differences in availability and consumption were compared using two-sample t-tests for dichotomous independent variables and ANOVAs for multiple group comparisons. All significance tests adjusted raw data using +1 normalization and log-transformations
[c] SD = standard deviation
*p<0.05 for transformed means

Table 6: 100% fruit juice average household availability and child consumption of 100% fruit juice by household food program and food security (trimmed data)[a]

		Household Availability	Child Per Day Consumption	Calories per day from 100% fruit juice	Sugar per day from 100% fruit juice
	n	mean (SD[b])	mean (SD)	mean (SD)	mean (SD)
		fluid oz	fluid oz	kcal	g
Overall	377	219.5 (234.4)	13.7 (12.6)	202.30 (185.00)	45.70 (42.20)
Food Security, USDA standard					
Secure	93	232.80* (219.31)	13.81 (12.79)	206.11 (191.95)	46.53 (44.14)
Insecure	279	182.58 (276.59)	13.54 (12.18)	194.78 (167.47)	44.06 (37.08)
Food Security, food insecure excludes marginal food security					
Secure	160	243.58** (234.57)	13.51 (12.10)	201.91 (183.26)	45.52 (42.35)
Insecure	212	189.33 (234.01)	14.06 (13.33)	204.92 (189.76)	46.39 (42.65)
Food Secure Levels					
High food security	212	243.58* (234.57)	13.51 (12.10)	201.91 (183.26)	45.53 (42.35)
Marginal Food Security	67	198.71 (158.52)	14.78 (14.84)	219.08 (217.63)	49.63 (49.50)
Low Food Security	74	189.82 (302.13)	14.34 (13.24)	205.99 (181.62)	46.28 (40.16)
Very Low Food Security	19	154.37 (140.59)	10.41 (5.80)	151.72 (858.51)	35.53 (20.10)
Currently Participated in SNAP[g]					
SNAP household	163	237.29 (294.47)	15.26* (13.32)	222.75* (197.42)	50.10* (44.56)
Not SNAP household	210	205.86 (176.07)	12.22 (11.46)	181.06 (167.34)	41.04 (38.68)
Currently Participate in WIC					
WIC Household	133	215.01 (170.77)	14.65 (13.04)	217.35 (202.37)	49.29 (45.98)
Not WIC Household	242	222.00 (263.98)	13.16 (12.34)	193.94 (174.83)	43.69 (40.05)
Federal Food Assistance Participation					
No participation	165	204.87 (174.33)	11.50 (10.48)	170.30 (148.06)	38.47 (34.21)
Participate in only SNAP	75	260.50 (396.20)	16.58* (14.80)	238.54* (210.57)	53.51* (47.10)
Participate in only WIC	45	209.50 (184.30)	14.85 (14.31)	218.61 (219.87)	50.03 (50.77)
Participate in SNAP and WIC	87	218.17 (165.41)	14.16 (11.95)	210.61 (186.60)	47.47 (41.72)

[a] Group differences in availability and consumption were compared using two-sample t-tests for dichotomous independent variables and ANOVAs for multiple group comparisons. All significance tests adjusted raw data using +1 normalization and log-transformations

[b]SD = standard deviation

*p<0.05 transformed data

**p=0.001 transformed data

Table 7: 100% fruit juice ounces available by food security levels (Tamhane's T2 method)

(I) Food Security Levels	(J) Food Security Levels	Mean Difference (I-J)	Standard Error	Significance	95% Confidence Interval	
					Lower Bound	Upper Bound
High Security	Marginal	0.10	0.05	0.41	-0.05	0.25
	Low	0.14	0.05	0.03	0.01	0.27
	Very Low	0.27	0.12	0.19	-0.08	0.63

Initial analysis found $p<.05$ between food secure and insecure, using the USDA standard and $p<.001$ between food secure and insecure, where insecure includes marginal food security.

Table 8: Food assistance participation and child daily consumption of 100% fruit juice (Bonferroni post hoc test)

(I) Food Assistance Participation	(J) Food Assistance Participation	Mean Difference (I-J)	Standard Error	Significance	95% Confidence Interval	
					Lower Bound	Upper Bound
No participation	SNAP only	-0.17	0.05	0.01	-0.31	-0.03
	WIC only	-0.14	0.06	0.16	-0.31	0.03
	Both SNAP and WIC	-0.12	0.05	0.14	-0.25	0.02

Table 9: Food assistance participation and child daily caloric intake from 100% juice (Bonferroni post hoc test)

(I) Food Assistance Participation	(J) Food Assistance Participation	Mean Difference (I-J)	Standard Error	Significance	95% Confidence Interval	
					Lower Bound	Upper Bound
No participation	SNAP only	-0.18	0.06	0.04	-0.35	-0.01
	WIC only	-0.14	0.08	0.41	-0.35	0.06
	Both SNAP and WIC	-0.09	0.06	0.96	-0.24	0.08

Table 10: Food assistance participation and child daily sugar intake, in grams, from 100% fruit juice (Bonferroni post hoc test)

(I) Food Assistance Participation	(J) Food Assistance Participation	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
No participation	SNAP only	-0.16	0.06	0.04	-0.32	-0.01
	WIC only	-0.14	0.07	0.31	-0.33	0.05
	Both SNAP and WIC	-0.10	0.06	0.51	-0.25	0.05

CHAPTER IV: DISCUSSION

Consumption of SSB and 100% fruit juice is on the rise among children, even preschool aged children.[1,2] On average, preschool children are consuming more SSB and 100% fruit juice than is recommended by the American Academy of Pediatrics.[2,13] While research analyzing trends in beverage consumption by children is extensive, few studies examine household availability of beverages or the role of household characteristics on household availability or child consumption of beverages. This thesis is an initial exploration of associations between household SSB and 100% fruit juice availability and household characteristics of food security and food assistance participation and associations between preschool child beverage consumption and food security and food assistance participation. As an extension of this preliminary study, more sophisticated analyses will remediate the gap in the literature regarding household availability of beverages.

Study Population Demographic Characteristics

Overall our study population is representative of the Hartford city population, but is incongruent in some ways to previous studies conducted by this same research group using a similar sample from Hartford. According to the 2010 Census[70] the city of Hartford is predominantly Black/African American and of Hispanic ethnicity. This study and previous research by this team reflect the same racial and ethnic profile. The average household size, 2.48 persons, according to the Census is close to the average household size within this study, 3.80 persons. Findings for food security levels and food assistance participation

rates in this study are lower than levels reported from research conducted by the same team using a similar sampling strategy. The 2010 Census reports 81% of Hartford residents have a high school diploma or Bachelor's degree,[70] similar to the 90% of this sample with at least a high school diploma. Previous studies by this research group using a sample only from the City of Hartford found 73%,[63] 67%,[35] 65%,[71] and 57%[72] of their sample with at least a high school diploma. Also, 26% of participants in this study were food insecure, according to the USDA standard, but previous studies from the same research team also using the USDA standard found food insecurity levels of 38% in 2009[72] and 61%[71] in a 2012 publication. Finding only 26% food insecure seems low considering the national trend of increasing food insecurity.[40] Seventy percent and 56% of participants in previous studies conducted by this team received SNAP and WIC, respectively[71] compared to 45% and 35%, respectively, from this study.

The observed differences in study population demographics between this study and previous studies conducted by this team could be due to varying sample recruitment methods. All of the previous studies by this research team had participants that were recruited from random locations strictly within the City of Hartford. For example, participants recruited for Martin et al. study[71] were random customers at 19 corner stores in the City of Hartford. The sample in this study, on the other hand, includes participants from preschools in neighboring towns with higher household incomes and average median income.[73,74] In addition, a few of the Hartford public schools in our study are magnet schools with open enrollment to any student in the state, leading to participants that were

not Hartford residents. Since recruitment for our study was not localized to just the City of Hartford, differences in study sample from previous studies by this team are expected.

Regarding differing education levels, recruitment for this study only occurred in preschools. Although some of the preschools have a sliding scale for payment, few of the preschools were free. If parents had their child in preschool they needed some sort of income to cover the costs of school; therefore, it seems likely that our caregivers would be employed and most jobs require at least a high school diploma. Since we were not randomly recruiting from the streets or health fairs of Hartford, it is not coincidental that our sample is more educated than participants from previous research projects by this team.

Although the demographic profiles of the surrounding towns where these participants live are similar to Hartford, the average median income and household values are much higher than those in Hartford.[73,74] A large percent of our participants, though they might live outside Hartford, still face financial struggles suggesting that there could be a personality difference in caretakers who are able to move their families outside of the city to surrounding suburbs that could impact beverage behavior. Although 90% of our sample have attained at least high school diploma it is important to note that 45% of the sample lives in food insecure homes and 56% of our sample receive federal food assistance.

Overconsumption of SSB and 100% Fruit Juice

Average consumption of SSB and 100% fruit juice by the preschool

children in this study exceeded American Academy of Pediatrics and WIC program recommendations for consumption. Children in this study consumed 12 fluid ounces of SSB per day, even though both the American Academy of Pediatrics and the WIC program suggest that preschool children do not consume any SSB as it is not a nutritionally adequate food.[13,75] and the children in this study consumed twice the recommended amount of 100% fruit juice as per the American Academy of Pediatrics recommendations.[13] This overconsumption of SSB and 100% fruit juice is not a novel finding; it supports a number of previous studies[1,2,3,4,8,9] that analyzed beverage consumption. Specifically, the study by Wang et al. found that per capita consumption of SSB by 2-5 year olds was 15.5 fluid ounces and per capita consumption of 100% fruit juice by 2-5 year olds was 11.1 fluid ounces.[2] Compared to this study, all of the studies that found overconsumption of SSB and 100% fruit juice captured beverage consumption using food recall, which further supports the potential value of cross referencing the HBI reported consumption with the participant's 48-hour recall. While the Home Beverage Inventory is also self-reported data, the food recall is more accurate as the caretaker reports what the child consumed most recently. For the Home Beverage Inventory, the caretaker reports estimated frequency of consumption. Using the Home Beverage Inventory and the food recall could reveal significant differences.

Consequent of overconsumption of SSB and 100% fruit juice, daily caloric and sugar intake from SSB and 100% fruit juice among the children in this study are concerning. Previous studies have found that consumption of SSB and over

consumption of 100% fruit juice lead to an increase in caloric and sugar in take, which could lead to overweight or obesity in children.[2,7,55,56,57] An important detail is that the 350 calories per day are consumed by preschoolers from beverages that are available in the household. This does not include beverages the child drinks from other sources, such as provided juice and sweetened milk from day care. Notably all preschoolers in the study were enrolled in child care programs where they spend a substantial amount of the day.

In Hartford, 73% of preschool aged children receive center-based care (J.Crowell, in conversation with Ann Ferris) compared to 43% nationally.[76] During the preschool day, children in the centers from which we recruited received breakfast, lunch, and two snacks per day. With each meal, children had a choice of 100% fruit juice or white milk. If children self selected 100% fruit juice, and are then fed juice when they get home, actual fluid ounce, caloric, and grams sugar consumption would be higher than reported in this paper. Juice consumption at school, then at home, raises concern and should prompt further research to assess actual levels of per day juice consumption.

Household Availability and Consumption of SSB

In this sample, neither household food security nor federal food assistance programs were associated with household availability or reported child consumption of SSB, which was unexpected. The lack of significance was surprising because existing research shows food purchase is driven by economic status.[17] Among flavored beverage options (i.e.: excluding bottled water) SSBs are an inexpensive beverage.[6] Also, although the lack of statistical difference is

inconsistent with previous research that found SSB are consumed most by children in low-income households,[8,9] the difference my lie in how SSB were categorized and analyzed. This study combined many beverages into the SSB category (flavored milks, powder juice drinks, iced tea, syrups, sports drinks, and soda) whereas Hamasha et al., for example, analyzed soda and powdered beverages separately and found significance in consumption of SSB by income levels.[8] Pinard et al. did not include syrups or flavored milks in the category of SSB. In the next phase of this analysis, the SSB category could be defined differently, excluding beverages that are less commonly grouped with the SSB category, therefore allowing results to be more appropriately comparable between studies.

Another surprising result was not finding a significant difference between per day fluid ounce consumption by SNAP status but finding statistical significance between per day intake of calories and grams of sugar by SNAP status. Although fluid ounce consumption of SSB by SNAP status was approaching significance, the difference in fluid ounce consumption and calories and sugar could be because the ratio of calories and sugar per fluid ounce are not necessarily an equal ratio. Some SSB companies are replacing high fructose corn syrup with artificial sugar, which in turn causes a decrease in calories and grams of sugar per fluid ounce serving. For example Little Hugs, Kool Aid, and Hawaiian Punch[77,78,79] use sucralose along with high fructose corn syrup to sweeten beverages. An eight ounce serving of Little Hugs has 2 grams of sugar[77] and 8 ounces of Hawaiian Punch has 17 grams of sugar.[79] Kool Aid has

varying levels of sugar content within its own brand. Kool Aid Jammers have 20 grams of sugar and no artificial sugar listed, whereas Kool Aid Bursts have 9 grams of sugar with artificial sugar listed as one of the ingredients. The use of artificial sugar in SSB likely impacted the ratio of calories and sugar per fluid ounce serving which could have led to finding significant differences for caloric and sugar intake but not fluid ounce consumption.

The use of artificial sugar in SSB also contributes to the noticeable difference in calorie and sugar amounts when SSB are compared to 100% fruit juice. At a glance, there seems to be a large difference in this data for per day intake of calories and grams of sugar in 100% fruit juice compared to SSB even though consumption only differs by one ounce. This could be due to the range of sugar in SSB compared to 100% fruit juice. For example, an 8 ounce serving of Ocean Spray 100% Cranberry Juice has 36 grams of sugar[80] compared to an 8 ounce serving of Little Hugs, which has 2 grams of sugar.[77] Extended analysis of the data would be necessary to figure out if the differences in caloric and sugar intake of SSB and 100% fruit juice are actually significant. Exploration of the calorie and sugar information for the beverages could help surface a reason for the difference.

Household Availability and Consumption of 100% Fruit Juice

As hypothesized, 100% fruit juice was more available among food secure households. A higher inventory of 100% fruit juice in food secure households is expected since 100% fruit juice is 27% more expensive than fruit drinks[6] and because purchase of healthier foods is restricted based on economic status.[17]

Thus, persons in higher income homes, not concerned about accessibility to food, would be more likely to purchase the more expensive alternative. However, there was no statistical difference in household availability of 100% fruit juice by food assistance participation. It was hypothesized that households that participate in WIC would have more 100% fruit juice available because it comes with their food package and because 100% fruit juice is so expensive it would likely not be purchased by SNAP recipients. No other research was available to compare results, so further analysis should be conducted to better explore household availability of 100% fruit juice.

Unexpectedly, one hundred percent fruit juice consumption was significantly more among children in SNAP households compared to children in households that do not participate in any federal food assistance programs. Because WIC participants receive 100% fruit juice in their food package, it was hypothesized that children in households that participate in WIC would consume more 100% fruit juice than children in SNAP homes or homes that do not receive any federal food assistance. However, perhaps the children in WIC households do not consume the most 100% fruit juice because caretakers who receive WIC benefits are required to participate in health education. The WIC program recommends only 4-6 fluid ounces of 100% fruit juice per day.[75] Therefore, maybe caretakers in the WIC program give their children fewer fluid ounces of 100% fruit juice because of their nutrition knowledge from the WIC program. Although Pinard et al found consumption of 100% fruit juice highest among children in low-income households,[9] beverage consumption data for Pinard et al.

came from a 24-food record. The next phase in this study will be to cross reference the HBI recorded consumption with actual consumption from the 48-hour food recall so as to assess accuracy of recorded child consumption in the HBI.

Although further analysis of the Husky Byte study data should explore whether or not beverage availability leads to beverage consumption, as has been previously found,[44] it seems counterintuitive that in this study 100% fruit juice is more available in food secure than food insecure households but children in SNAP households consume more 100% fruit juice than children in non-SNAP households or children in households that receive no federal food assistance. The relationship between food security and SNAP participation should be explored because individuals that initiate their own participation in SNAP have increased levels of food security.[40] If households on SNAP are more food secure, they might not face the same economical distress or food purchasing behaviors as individuals who are food insecure. Continued exploration of the variables could reveal whether or not this Husky Byte sample SNAP recipients are more food secure than insecure.

CHAPTER V: CONCLUSION

Study Strengths and Limitations

There were some strengths to the Husky Byte study design that tried to mitigate error. First, each Husky Byte interviewer was highly trained before independently conducting interviews. Interviewers learned about the interview instruments and how to use them prior to going into the field. After learning about the interview instruments, interviewers accompanied and observed a seasoned interviewer. Only after a few observations and practice interviews was the interviewer then able to conduct interviews independently. Second, many tools were used to reduce error with participant recall. When a participant was unsure of the beverage container size, the interviewer referenced a packet with pictures of brand name beverages, including the fluid ounce size of the container. This allowed the participant to more accurately recall the size of the beverage container at home. Also, each participant received three different size cups (5 ounce, 8 ounce, 12 ounce) at the beginning of the study. These cups were references by the interviewer, who had a set available during the interview, when inquiring about the amount the child consumed. Tablespoons and teaspoons were also used to help the participant better estimate the amount of syrup used to flavor a beverage.

While this study has many strengths, there are some limitations that most likely impacted the results. Although interviews were conducted throughout the year, the timing of the interview was not taken into account for this paper. This is important to note because there are many variables in this study that change

throughout the year. First, food security fluctuates throughout the year and is also highly influenced by economic constraints,[81] which are also unstable throughout the year. Food security levels should be measured over years to assess the continued ability of a household to access food. Second, the amount of food and beverages in the home varies within the month among SNAP participants, but the analysis did not control for the potential variations in beverage availability by time of the month.[72] Food and beverage purchasing peaks at the beginning of the month and wanes toward the end of the month[34,43] which can affect beverage availability in the home.

Also considering the timing of the interviews, multiple beverage inventories should have be collected throughout the month[82] to better represent beverage availability and consumption. As mentioned, the SNAP cycle can impact what is in the house depending on the timing of the interview. Consumption of juices may vary throughout the year, as well.[83] Children may consume more flavored milk in the wintertime in the form of hot chocolate, or children may consume more SSB and 100% fruit juice in the summer time to combat heat or more sports drinks to replenish sweat lost. Actual beverage consumption habits would be more accurate if consumption was measured for each participant throughout the year.

This study is not without self report error, an error that is commonplace in nutrition research. It is well documented that individuals inaccurately report food intake and amount of consumption when relying on memory.[84,85] Inaccurately reporting the preschool child's consumption cannot be overlooked because

although there is some consistency reporting pre-packaged beverages,[86] many of the beverages the children consumed were served in glasses, not pre-packaged boxes or pouches. Inconsistencies were identified during data cleaning in terms of reporting frequency of consumption. Also, there was some inconsistency in reporting consumption frequency. Some interviewers probed the participant in order to obtain more specific consumption data including consumption per day and per week, but this was not consistent. So, some frequency data is very specific to amount per week whereas some are not as specific. Because of this, an assumption had to be made that if the number of times per week were not specified, it was assumed that the frequency was for every day of the week (Table A1).

There could have been self report error regarding SNAP and WIC participation and food security level as well. Single parents, non-whites, and individuals in low-income households tend to underreport participation in SNAP and WIC.[87] If this is true for this study population as well, differences in availability and consumption data could be more significant than currently represented. Also, because food insecurity is a highly sensitive, emotional topic, it is likely that participants over-reported food security so as to minimize stigmatization.[40] This is likely for this study because although participants were interviewed, for privacy sake some interviewers may have allowed the participant to fill out the food security questionnaire on their own, rather than being read the questions and responding orally. Also, self-selected participation in food assistance programs, specifically SNAP, can decrease the prevalence of very

low food security by nearly 30%[88,89] which could explain statistical significant differences of SSB consumption among the SNAP but not the food insecure participants.

A specific limitation of the HBI is that for the purposes of this study and to ensure consistency in measurement of available beverages, researchers assumed, and therefore recorded, all beverage containers as full. Even though accurately measuring the volume of containers would be an impractical task, assuming that all containers are full could lead to overrepresentation of the amount of ounces available in the home.

It is necessary to note there were multiple large differences between variables of beverage availability and consumption, but few statistical findings. Data from the pre-trim and pre-log transformation demonstrate the expansive range of beverage availability and consumption, and suggest either a different method of recording beverage availability and consumption or the need for a different consumption instrument to assess quality of the HBI. For this particular study, consumption data should be cross-referenced with beverage consumption data of the 48-hour preschool child food recall; comparing the two documents could help establish inconsistencies in the recorded data. All of these recording errors and assumptions could have contributed to the extreme outliers of ounces available in the household and consumption habits of the preschool child. Many of the standard deviations were the same or greater than the means which can directly impact statistical significance.

Implications for Public Health Policy and Suggested Further Research

This results from paper show that these households with preschool children had an average of nearly four and a half gallons of SSB beverages and nearly two gallons of 100% fruit juice in their house. Based on what is available in the household it is no surprise that the children consumed more SSB and 100% fruit juice than the American Academy of Pediatrics recommends. Excessive household beverage availability and overconsumption of SSB and 100% fruit juice is pervasive and urges intervention.

It cannot be stated strongly enough that this data represents availability and consumption of beverages based on what is in the home, not based on what the child drinks from other sources. The reported average of 12 fluid ounces of SSB and 14 fluid ounces of 100% fruit juice consumption does not include the beverages the preschool child receives at school. Federal guidelines restrict preschools to serving only 100% fruit juice or white milk[92] but few efforts, other than disincentives like proposed taxes,[90] have targeted household beverage availability or consumption of beverages from home. If 60-80% of beverage consumption occurs at home,[2] it seems that efforts should now be focused on reducing beverage availability in the household.

The focus on household beverage availability should not necessarily be aimed at just low income or SNAP recipients. In this study, 86% of all households had SSB available and 80% of households had 100% fruit juice available. Rather than pose restrictions or focus efforts on a particular population, household beverage availability and nutrition education about appropriate beverage consumption among children should be delivered to the general

population rather than taking a targeted approach. School-based education has been effective demonstrated by a study that found that children as young as seven changed their diet habits and decreased SSB consumption due to school-based health education.[94] Yet while some instructional efforts focus on educating the students or teachers and assistants in the preschools,[93] interventions and instruction should focus on behavior change in the home setting. Other places of potential education that could impact household beverage habits include education from primary care physicians or in primary care settings, grocery stores and places of point-of-sale, or individual home assessments from nutritionists. By focusing education on reducing what beverages are available, and consequently consumed, in the household, perhaps there could be a decrease in the overconsumption of SSB and 100% fruit juice since 60-80% of consumption occurs in the home.[2]

Policy changes could also impact household availability and consumption of beverages. Proposed beverage taxes, although raised with extreme opposition, could reduce consumption in the way that tobacco taxes have impacted cigarette smoking. Other policy changes could impact the size of beverages purchased. New York City recently declared that it will put a ban on the sale of beverage sizes larger than 16 fluid ounces.[95] Beverage size restrictions could help foster education on actual serving sizes of glasses, including those in the home. Many people incorrectly underestimate the size of their beverage glasses at home, which leads to people consuming more than they think they actually are. Because the availability of beverages in the home is

large despite economic differences, the general population could benefit from beverage education and policy change, not just low-income persons.

Future analyses of household beverage availability, specifically, and consumption among preschool children should be considered because sugar sweetened and 100% fruit juice consumption does not wane throughout childhood. Sugar sweetened beverage consumption increases as children get older. Preschool children prefer the juice drink fruit punch, but soda is the beverage of choice among children aged 6-11.[96] As children increase consumption of SSB and 100% fruit juice, they decrease their consumption of beverages with necessary nutritents.[97,98,99,100] Increased consumption reduces the intake of milk or other beverages that have calcium and other nutrients.[97,98,99] For adolescents, 33% of water intake came from water alone, but the remaining 67% of water consumption came from SSB,[100] which could be contributing to the added calories and sugar in children's diets.[57,59] With childhood obesity at concerning levels,[101] and with SSB and over consumption of 100% fruit juice contributing to the problem of excess calories consumed, research, education, and intervention directed towards children's beverage habits will be crucial to curbing the obvious trend of increasing consumption and caloric intake from beverages.

Continued research with this data should be considered because SSB consumption does not wane throughout childhood. It is already known that beverage consumption has increased significantly over the past decades.[2,7] Data from this study provides only an initial univariate analysis of beverage

availability and consumption based on household characteristics; there are many further explorations that can be done to uncover meaningful results. This research could also be replicated using a larger, more diverse sample population in order to further explore demographic characteristics and associations of beverage availability and consumption habits among preschool children, especially because consumption of and caloric intake from SSB and 100% fruit juice is on the rise specifically among children.[2,7]

In addition, reanalyzing the Husky Byte study data using non-parametric tests multivariate modeling may identify other significant relationships. Also, the 48-hour food recall should be used to assess the accuracy and quality of beverage consumption as estimated by the caretaker. Using the food recall results will allow more consistent comparison with previous studies, which measured child beverage consumption based on food recalls. Although more sophisticated analyses can be explored, this current paper does suggest how household characteristics can impact household availability or preschool child consumption of sugar sweetened beverages and 100% fruit juice.

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APPENDIX A
METHODOLOGY

Table A1. Assumption established by the research group for missing beverage availability in the household, preschool child consumption in ounces as recorded by the caretaker, and calories and sugar grams as calculated from ounces consumed

100% Juice	Assumption	Reason
"Lemon Juice" as written	Assume 100% Juice	As per ingredient list
"V8" listed as exactly that	Assume 100% juice - tomato drink	most of the V8 drinks are specified if they are juices; some sizes of the containers of V8 are obviously the tomato juice (i.e.: cans 5.5)
36 ounce juice does not exist	Assume 32 if brand not listed	36 oz juice not found on internet or grocery store
Apple and Eve apple juice box	Comes in 4.23 oz, 6.75 oz and 8.45 oz	As per manufacturer website
Apple and Eve Juice	4.23 oz, 6.75 oz, 8.45 oz, 10 oz, 16 oz, 48 oz, 64 oz, and 128 oz	As per manufacturer website
Apple and Eve Punch	Exists as 100% Juice and Juice Drink	As per manufacturer website
Apple and Eve Strawberry Kiwi and Carrot	Fruitables; Diluted 100% fruit juice	As per ingredient list
Apple juice bottle	Apple juice Tropicana 15.2 oz	As per manufacturer website
Apple juice size listed is "pouch"	Assume 6 oz	Based on research of apple juice that actually comes in a pouch vs. a box
Assume Capri Sun listed as 100% IS 100% unless flavor does not exist in 100% (i.e.: Cherry)	After double checking the HBI written documents, more Capri Sun 100% FJ were recorded correctly than incorrectly	
Berkley and Jensen 36 oz does not exist	Assume 32 ounce	As per manufacturer website and Internet search
Capri Sun 100% Juice Flavors	fruit punch, berry, apple, citrus, grape, fruit dive	As per manufacturer website
Capri Sun Fruit Punch*	Exists in both juice drink and 100% FJ. Only keep 100% FJ if listed originally in HBI	As per manufacturer website
Clamato Juice (tomato juice and clam juice)	100% Juice	As per ingredient list
Concentrated apple juice frozen can	Comes in a pack of 12 cans	As per manufacturer website and Internet search

Cranberry Juice	If brand not listed, assume Ocean Spray - which is assumed 100% juice drink blend (cranberry juice with apple, grape, etc.)	Ocean Spray Cranberry is the most common juice in our database
100% Juice	**Assumption**	**Reason**
Dilute 1 can in 3 cans of water = 48 oz of total liquid prepared	concentrate = 48 fl oz	As per multiple manufacturer website
DOLE apple juice	15.2 oz	As per manufacturer website
Dole Pineapple Juice	8.4 oz	As per manufacturer website and Internet search
Fruit Punch	100% Juice for: Capri Sun*, Juicy Juice, Minute Maid, Back to Nature	As per manufacturers' website and Internet search
Grape Juice	If brand not listed, assume Welch's and 100%	Most common brand for grape juice in our database
Grapefruit Juice	When not listed, assume Ocean Spray 100% Juice	Most common brand for grapefruit juice in our database
Green Plant Juice	100% vegetable and juice drink from Trader Joes - categorize as 100% juice	As per manufacturer website and Internet search
Juice boxes when not specified (also in "Juice Drink")	One 6.75 box	Most common size for juice box in our database
Juice missing size	Assume 64 oz	most juices are in 64 ounce size
Juicy Juice	When not listed, assume 100% juice	100% juice most common by manufacturer and in our database
Juicy juice 32 oz	Does not exist, assume 46 oz	As per manufacturer website and Internet search
Juicy Juice 36 oz does not exist	Assume 46 oz	As per manufacturer website and Internet search
Juicy Juice Sizes	4.23 oz (box), 6.75 oz (some flavors), 10 oz,11.5 oz (concentrate, makes 48 oz)46 oz, 48 oz, 64 oz, concentrate makes 48 oz	As per manufacturer website
Lucky Leaf Juice	Assume 64 ounce bottle	Most common size for juice in this brand and in database

Minute Maid - No flavor	Assume Orange Juice	Most common flavor of Minute Maid in database
Minute Maid 12 oz OJ	Does not exist, assume 10 oz	As per manufacturer website and Internet search
100% Juice	**Assumption**	**Reason**
Minute Maid 8.75 oz does not exist	8 oz (in OJ only), 10 oz other flavors	As per manufacturer website
Minute Maid Juice Boxes: minis - 100% Juice	4.22 oz (125 mL)	As per manufacturer website and Internet search
Minute Maid OJ - 36 oz does not exist	Assume 32 oz	Although 32 oz MM OJ is rare, it is available on the MM website
MM 8.75 oz does not exist	If OJ, assume 8 oz because other flavors do not exist in 8 oz	As per manufacturer website
Ocean Spray cranberry juice	Assume 100% juice	As per manufacturer website
Ocean Spray does not exist in 4.2 oz	Assume 10 oz bottle, the smallest size available	As per manufacturer website and Internet search
Price Rite Apple Juice 36 oz does not exist	2 qts = 64 oz	Researcher personally called to inquire
Prune Juice	100% Juice	As per ingredient list
Sparkling Cider	Assume 100% Juice	Ingredients list from website: "Pasteurized 100% pure carbonated apple juice from U.S. grown fresh apples, vitamin C, no water or alcohol, no concentrates, no sweeteners or preservatives"
Tropicana Non-Refrigerated Juices - orange juice	10, 15.2, 32, 64, 96 ounces	As per manufacturer website
Tropicana 36 oz does not exist	Assume 32 oz	36 oz juice not found on internet or grocery store
Tropicana bananas orange strawberry	does exist as 100% juice	As per manufacturer website and Internet search
Tropicana Non-Refrigerated Juice - Apple	10, 15.2, 32	As per manufacturer website

Tropicana Non-Refrigerated Juice - CHECK OUNCES for other juices	Check ounces	As per manufacturer website - ounces are different depending on flavor
V8 Fusion	100% Juice	As per ingredient list
V8 Fusion - 64 oz does not exist	Assume 46 oz	As per manufacturer website
100% Juice	**Assumption**	**Reason**
V8 fusion regular (not v8 Fusion smoothie, v8 Fusion tea, or V8 fusion light)	100% juice	As per manufacturer website
V8-If not specified then assume regular V8 vegetable juice	100% Fruit Juice	
Welch individual pack	64 oz	Most common size for juice in our database
Welch juice 12 oz bottle	Does not exist, assume 14 oz bottle	As per manufacturer website and Internet search
Welch's 11.5 oz concentrated makes	46 fl oz	As per manufacturer website
Welch's 12 oz can does not exist	Assume 11.5 oz	As per manufacturer website
Welch's 24 oz	Does not exist, assume 11.5 oz can	As per manufacturer website and Internet search
When amount of 100% juice written as "1 64 oz bottle"	One 64 oz bottle	Most common size for juice in our database
When amount of juicy juice is not specified	One 64 oz bottle	Most common size for juice in our database
When can size is not specified	12 oz	This is the most common can size for beverages
When juice type not specified for Apple and Eve	Assume Apple Juice	Most common flavor of Apple and Eve in database
When juice type not specified for Tropicana	Assume Orange Juice	Most common flavor of Tropicana in database
When MM OJ is not specified in volume	64 oz	This is the most common size for orange juice
When OJ (brand not listed) does not have volume	Assume 64 oz	Most common size for juice in our database
"Arnold Palmer" = lemonade and ice tea together	Juice Drink	As per manufacturer and Internet search
"Lemonade Powder, 53 oz"	4C half and Half - iced tea and lemonade (Arnold Palmer) just add water and ice	As per manufacturer and Internet search
36 ounce juice does not exist	Assume 32 if brand not listed	As per Internet search
Apple and Eve orange carrot	Juice drink	As per manufacturer website

Apple and Eve Punch	Exists as 100% Juice and Juice Drink	As per manufacturer website and ingredient list

100% Juice	Assumption	Reason
Assume V8 splash and smoothie is a juice drink	Juice drink	As per manufacturer website and ingredient list
Berry juice drink 4 oz (also noted in "sports drink")	Gatorade Berry 4 oz, 1 case = 20	As per Internet search
Capri sun	6 oz	As per manufacturer website
Capri Sun - 36 oz does not exist	Only comes in 6 oz pouches	As per manufacturer website
Capri Sun Cherry	Juice Drink	As per manufacturer website and ingredient list
Capri Sun Roarin water	Juice drink	As per manufacturer website
Countrytime Lemonade	If size missing assume 19 oz	Most common beverage can size in database
Cranberry apple	Juice drink	As per manufacturer website and ingredient list
Crystal Light will not be considered for our research	Crystal light uses only fake sugar; we are only interested in beverages that have added sugar (or a combination of added and fake sugar, which is the trend now)	
Dilute 1 can in 3 cans of water = 48 oz of total liquid prepared	Concentrated can = 48 oz	
Fruit Punch - no brand listed	Assume juice drink	As per majority of fruit punch ingredient lists
Grapefruit Juice Minute Maid	NOT 100% Juice	As per ingredient list
Hansens Junior Water	Juice Drink - "hint of 100% juice with added cane sugar"	As per ingredient list
Hi-C sizes	only 6.75 oz juice box	As per manufacturer website
Honest Kids - NOT 100% Juice - includes added cane	Juice Drink	As per manufacturer website and ingredient

sugar		list
Honest Kids, 8.75 oz does not exist	6.75 oz	As per manufacturer website

100% Juice	Assumption	Reason
Juice boxes when not specified	One 6.75 box	Most common juice box size in database
Kool Aid 36 oz	Does not exist, assume 6 oz	As per manufacturer and Internet search
Kool Aid bottle	Kool Aid 6.75 oz bottle	As per manufacturer website
Light Juice Drinks (originally juice drink)	Assume Juice Drink	As per ingredient list
Malta Missing Container size	Assume 12 oz	As per manufacturer and Internet search
Minute Maid - no flavor	Assume Orange Juice 100% Juice	Most Common flavor of Minute Maid in database
Minute Maid Fruit Punch "bottle"	36 oz does not exist. Assume 20 oz bottle	As per manufacturer and Internet search
Nature's Nectar Grapefruit Juice (Aldi)	Juice Drink	As per manufacturer website and ingredient list
Ocean Spray Cran ……(Cran+other flavor)	Juice Drink	As per manufacturer website and ingredient list
Ocean Spray White Cran Strawberry Juice	Juice Drink	As per manufacturer website and ingredient list
Odwalla	Juice drink	As per manufacturer website and ingredient list
Snapple If missing amount	Assume 20 oz	As per manufacturer website
Snapple ounces	16 and 20 ounces only	As per manufacturer website
Sunny D - 36 oz does not exist	Assume 48 oz as per aforementioned Assumption	As per manufacturer and Internet search
Sunny D 8 oz does not exist	Assume 10 oz	As per manufacturer website
Sunny D assume when size not available	Assume 48 oz	As per manufacturer website
Sunny D if size of container is missing	Assume 64 oz	As per manufacturer website
Tropicana Non-Refrigerated Juices - orange juice	10, 15.2, 32, 64, 96 ounces	As per manufacturer website

Tropicana Non-Refrigerated Juice - Apple	10, 15.2, 32	As per manufacturer website

100% Juice	Assumption	Reason
Tropicana Non-Refrigerated Juice - CHECK OUNCES for other juices	Check ounces	36 oz juice not found on internet or grocery store
V8 Fusion - 64 oz does not exist (for Fusion smoothie, fusion tea, fusion light)	Assume 46 oz	As per manufacturer website
V8-If not specified then assume regular V8 vegetable juice	100% Fruit Juice	Most common V8 flavor in database
Welchito	Juice drink	As per ingredient list
Welchito is 7.5 oz and comes in a case of 48	Juice Drink	As per Internet search
When can size is not specified	12 oz	Most common beverage can size in database
When size of kool aid (liquid) is not specified	Assume 6 oz pouch	Most common Kool Aid size in our database
"Arnold Palmer" = lemonade and ice tea together	Juice Drink	As per manufacturer and Internet search

Energy Drink/Sports Drink	Assumption	Reason
"Medium container"	Assume 32 oz	As per manufacturer website and Internet search
Berry juice drink 4 oz	Gatorade Berry 4 oz, 1 case = 20	16 oz was the most common size within our data for sports drink
Gatorade 36 oz does not exist	Assume 32 oz	As per manufacturer website
Gatorade Lite (or G2)	Categorize as sports drink as well, even though there are fake sugars in there	As per manufacturer website and ingredient list
MiO - water enhancer; 0% juice, main ingredient is water, flavoring and fake sugar	Categorize as sports drink	As per manufacturer website and ingredient list
Red Bull	8.4 oz	As per manufacturer website
Sports Drink - If amount not specified	Assume 16 oz	Most common sports drink container size in database

Soda	Assumption	Reason
Coke Zero, Pepsi Max, Fresca	DIET sodas	As per manufacturer website

Ginger Ale - 36 oz does not exist	Assume 1 L (33.8 oz)	As per Internet search
Soda "cases"	assume 12 oz cans in cases	Common can size in soda case
Tonic Water	Soda	As per ingredient list
When missing amount of soda	Assume 2 L	Most common soda container size in database

Syrups	Assumption	Reason
Chocolate syrup squeeze bottle	Assume 24 oz Hershey's	Most common brand and bottle size in database
When amount of syrup missing	1 tsp	Most common measured amount for syrup
Pancake Syrup - 22 oz very rare (Log Cabin only brand)	Assume 24 oz, if brand not specified	As per Internet search
Chocolate Syrup - Hershey's 24 oz, Nesquik 22 oz	Assume 24 oz Hershey's and it is 24 oz	As per manufacturers' websites
"Medium size" pancake syrup	12 oz	As per manufacturer website and Internet search
"Small" pancake syrup	8 oz	As per manufacturer website and Internet search
"Smaller" strawberry syrup	16 oz	As per manufacturer website and Internet search

Coffee and Tea	Assumption	Reason
Coffee and tea (regular coffee and hot tea bags)	Not included in database	Powder and liquid teas come in very different sizes; prepared, liquid ice tea has similar ounces to other liquid drinks

Chocolate Milk	Assumption	Reason
Carnation Breakfast Drink	Assume liquid (11 oz bottle) if not specified	Most common form of Carnation"breakfast drink" in database

Chocolate milk	If ounces not specified, assume 8 oz (Hershey's)	Most common beverage size for this brand
Nesquick 64 oz	Assume liquid choc or strawberry milk. No powder in this size	As per manufacturer website
Yoohoo	Assume 9 oz bottle	As per manufacturer website
YooHoo 6.75 oz	Does not exist, assume 6.5 oz	As per manufacturer website

Diluted 100% Juice (a beverage that is 100% juice diluted with purified/regular water)	**Assumption**	**Reason**
Apple and Eve Fruitables 32 oz does not exist	Assume 64 ounces	As per manufacturer website
Apple and Eve Fruitables Strawberry Kiwi and Carrot	Diluted 100% Fruit juice	As per manufacturer website
Fruitables	100% Juice with purified water	As per ingredient list
Gerber Splashers	100% juice with purified water	As per ingredient list
Mott's for Tots - 8.75 oz does not exist	6.75 oz	As per manufacturer website
When size of Fruitables is missing	Assume 4.23 oz	Most common juice box size for this brand in our database

Diet/Low Calorie Juice Beverage (a beverage that is diluted 100% juice with purified water and sugar substitute)	**Assumption**	**Reason**
Minute Maid OJ light (purified water, but also sucralose)	Diet/Low Calorie Beverage	As per ingredient list
Ocean Spray Light	Diet/Low Calorie Beverage	As per ingredient list

Icea Tea	**Assumption**	**Reason**
4C 84 ounce does not exist	Assume 74.2 oz	As per manufacturer website
Iced tea 36 oz does not exist	Assume 26.5 oz	As per manufacturer website
If Iced tea is near 3 oz (ex:4.24 oz or 120 g)	Assume unsweetened	Based on size of ounces. Most tea in database ≥3 oz listed as "tea bag" or other such non-sweetened tea source
Lipton Ice Tea 1 lb	Assume 1 lb 10.5 oz = 26.5 oz	As per manufacturer website, 1 lb size does not exist
When "ice tea powder"	Assume Lipton sweetened Ice tea	Most common brand of iced tea in database

	unless noted	
When "iced tea powder 68 oz"	Assume Lipton White Tea or Green tea	As per manufacturer website
When missing amount or size of ice tea canister	Assume a canister of 68 oz LIPTON	Most common brand name and size of container for iced tea in database

Juice Drink	**Assumption**	**Reason**
"Mixade" - Aldi brand of Crystal Light	Found on Aldi website	As per Aldi website
Country Time 8 oz does not exist	Assume 12 oz fluid can	As per manufacturer website
Crystal Light On-the-go	Not including Crystal Light	
Hawaiian Punch, on-the-go juice box	6.75 oz	As per manufacturer website and product directions
Kool Aid - individual packets	there are many sizes (ex: 0.13, 0.15. 0.17, 0.23, etc) - they all differ based on flavor; 0.13 is most common. BUT all individual packets require sugar and make 2 qts	As per manufacturer website
Kool Aid 2 L	Assume the 2L was prepared and came from 0.13 oz packet	As per manufacturer website and search for 2 L Kool Aid
Kool Aid Powder: 164 oz = TWO 5 lb 2.5 oz containers	Assume purchased from a BJs, Sam's, etc.	As per manufacturer website and Internet search
Powder packets Kool Aid	Assume 0.13 oz packs (0.55 oz are for individual bottles and contain added sugar)	As per manufacturer website
Tangerine powders	Assume Tang	Most common "tangerine" powder in database
When "16 oz" or some other oz that doesn't exist, see if the number matches the quarts it makes. Ex: "16 oz" lemonade doesn’t exist, but 36 oz that makes 16 qts does		
When Kool Aid "can" size is missing	Assume 5 lb 2.5 oz	Most common size of Kool Aid "can" in database
When Kool Aid amount (no indication of container) is missing	Assume 19 oz	Most common non-can size of Kool Aid in database
When size of Tang canister is missing	Assume 72 oz canister	As per manufacturer website

Powder Conversion Information

All as per ingredient list from physical container - not from online

Ice Tea

Lipton Sweet Ice Tea **26.5 oz** makes 10 quarts, 320 oz
Lipton Unsweet Tea **3 oz** (85 g) makes 30 qts
Lipton Ice tea 4 lb 10.2 oz (**74.2 oz**) makes 28 qts = 896 fl oz
Lipton Ice tea 6 lb 4 oz (**100 oz**) makes 38 qts = 1,216 fl oz
Lipton - green and white tea - **68 oz** powder makes 28 qts = 896 fl oz
Lipton Iced Tea - Mango **23.3 oz** makes 10 qts = 320 oz
Lipton Tea - Peach **28.3 oz** makes 10 qts = 320 oz
Lipton Tea - Flavored **23.3 oz** makes 10 qts = 320 oz
4C Ice Tea - 5lb 12.5 oz (**92.8 oz**) makes 35 quarts = 1,120 fl oz
4C **74.2 oz** makes 864 fluid ounces

4C half and half - Ice tea and lemonade - **53 ounces** makes 20 qts = 640 fl oz

4C light Iced tea Mix - **12.6 oz** makes 20 qts, 640 oz

Nestea **90.3 oz** makes 10 quarts, 320 oz
Herbalite Concentrated Tea, **1.8 oz** makes 210 ounces

Juice Drink

Kool Aid **19 oz** makes 8 qts, 256 oz
Kool Aid **5 lb 2.5 oz** makes 34 qts, 1088 oz
Kool Aid **0.55 oz** packet (sugar sweetened already) add to 16.9 oz water bottle

All as per ingredient list from physical container - not from online

Kool Aid **29 oz** makes 12 qts, 384 oz

Kool Aid **0.15 oz** makes 2 qts - need to add sugar
Kool Aid **0.17 oz** makes 2 qts - need to add sugar
Kool Aid **0.13 oz** makes 2 qts - need to add sugar

Kool Aid - **0.74 ox** add to 16.9 oz water

Tang **4 lb 8 oz, 72 oz** makes 22 quarts, 704 oz
Tang **20 oz** makes 6.1 qts
Country Time Lemonade **5 lb 2.5 oz (82.5 oz)** makes 34 qts, 1088 oz
Country Time Lemonade **19 oz** makes 8 qts/ **18 oz** makes 7.58 qts/**39 oz** makes 16.4 qts

4C Lemonade **36 oz** makes 16 qts

4C **1.88 oz (container size)** fruit punch makes 14 quarts (no sugar added; don't add sugar)
4C half and half - Ice tea and lemonade - 53 ounces makes 20 qts
4C Wildberry Pomegranate **36 oz** makes 16 qts, 512 oz

Gatorade Powder

If size of container not listed assume makes 8 qts

Any Beverage	Assumptions	Reason
Two beverages listed together (i.e.: 1%-2% milk; Strawberry/Chocolate Powder)	use the average of the sugar and calories	Similar beverages vary little in calories and sugar.
When missing child frequency	Assume 1/d and 1/w	
When frequency ex: “2/d”	Assume 7x/wk	
nutrition brand information cannot be found on product webpage	use MyFitnessPal.com, caloriecount.com, AND livestrong.com	Three sites in order to check consistency; and of the calorie sites, these are the most accurate and complete

100% Juice	Assumptions	Reason
"BJ's Brand" Listed	Assume Berkley & Jensen	Berkley & Jensen is common generic brand at BJs
"Cherry" flavor brand not specified	Assume Juicy Juice	Most common 100% juice brand in database
"Concentrated Apple Juice"	Assume Juicy Juice	As per manufacturer website and Internet search
"Fruit Punch" brand not specified	Assume Juicy Juice	Most common 100% juice brand for fruit punch in database
"Grape Juice" brand name missing	Assume Welch's	Most common grape juice brand in database
"Grapefruit Juice" brand is missing	Assume Ocean Spray	Most common grapefruit juice brand in database
"Juice Bowl"	Use apple juice nutrition	Best guess based on information provided from participant and based on using the most common flavor of 100% juice in database

100% Juice	Assumptions	Reason

"Juice, Store Brand" is listed	Assume Stop and Shop	Stop &Shop nutrition data most accurate and easiest to find
"organic apple juice"	Assume 365 Brand (Whole Food's Generic brand)	As per manufacturer website and Internet search
"Tropicana Fruit Medley" Does not exist	Assume V8 Splash, 100% Juice Fruit Medley	As per manufacturer website and Internet search
"Vegetable juice"	Assume V8 vegetable juice	Most common brand for vegetable juice in database
Aloe Vera Juice	Assume Trader Joes	As per Internet search
Apple & Eve "Berry Juice" "Very Berry" "very Berry juice"	Assume Apple & Eve Very Berry	As per manufacturer website
Apple Cider brand not specified	Assume Musselman's	Most common Apple Cider brand in database
Apple juice brand cannot be found	Assume Motts Original Apple Juice Nutrition	Most common brand for apple juice in database
apple juice type not specified	Assume Motts Original Apple Juice	Most common brand of apple juice in database
Apple Punch	Assume Mott's Plus Apple Punch	No other juice brand has apple punch
Brand not listed for berry juice	Assume Juicy Juice	As per manufacturer website and Internet search
brand not listed for Orange Juice/cannot find brand nutrition information	Assume Tropicana	Tropicana was entered in the data base more than any other orange juice brand
Capri Sun "Fruit Dive"	Assume Fruit Punch	As per manufacturer website
Capri Sun flavor not listed	Assume Fruit Punch	If parents are buying Capri Sun, more likely to buy "fun" flavors than one fruit flavor like apple
100% Juice	**Assumptions**	**Reason**

100% Fruit Juice	Assumptions	Reason
Carrot Juice - brand not listed	Assume Lakewood Brand	Only Carrot juice brand in our database that showed up in Google Shopping
Cranberry Apple Juice Box	Assume Apple & Eve	Not available from Juicy Juice; Apple & Eve next most popular brand that has Cran Apple 100% juice juice boxes
Cranberry brand not listed	Assume Ocean Spray	Most common brand for cranberry juice in database
Cranberry mixed with other fruit (pom, blueberry, etc.)	Assume Ocean Spray	Most common 100% cranberry juice and cranberry juice mix in database
Good Belly juice - no flavor listed	Assume pink grapefruit flavor	Seems to be the most regular flavor
Grape Juice - brand listed but brand listed doesn't have grape juice	Assume Welch's	Most common brand name for grape juice
Hansen's juice flavor not listed	Assume Apple Juice	Most common juice flavor in database
Juice blends with orange (i.e.: pineapple orange; orange strawberry, banana)	Assume Dole if Tropicana does not have them	As per manufacturer website and Internet search
Juice type not specified for Apple and Eve	Assume Apple Juice	Most common flavor in our database for Apple and Eve
juice type not specified for Tropicana	Assume Orange Juice	Most common flavor in database for Tropicana
Juicy Juice "Mixed"	Assume Fruit Punch	As per manufacturer website and ingredient list
Juicy Juice "Strawberry"	Assume Kiwi Strawberry	As per manufacturer website
Juicy Juice Flavor not specified	Assume Apple Juice	Most common flavor in our data base for Juicy Juice
Just "juice" or "juice box"	Assume apple/Mott's	Most common juice flavor and brand for apple

Kiwi Strawberry - no brand listed	Assume Juicy Juice	Juicy Juice and Apple & Eve tied for brand name in our database, but Juicy Juice is the more popular brand
Mango Juice - cant find brand	Assume Juicy Juice	As per manufacturer website and Internet search
Minute Maid "juice boxes"	Assume Apple Juice	Most common juice flavor in database
Minute Maid flavor missing	Assume Orange Juice	Most common flavor of Minute Maid in database
Mott's Medleys no flavor listed	Assume Apple/Carrot	Most common flavor of Motts Medleys in database
Motts "Mixed berry"	Assume Fruit Punch	As per manufacturer website and ingredient list
Ocean Spray flavor not listed	Assume Cranberry	Most common Ocean Spray flavor in database
Ocean Spray Fruit and Veggie	Assume Cranberry Pom Blueberry Flavor	Ocean Spray Cranberry most popular flavor within brand
Orange Mango Juice	Assume Simply juice	Tropicana or Minute Maid did not have Orange-Mango
Orange Pineapple Apple	Juice Drink from Welch's	As per manufacturer website and ingredient list
Orange Pineapple Juicy Juice	Does not exist, assume Tropicana	Minute Maid does not have 100% Pineapple Orange Juice
pineapple juice brand cannot be found	Assume Dole Pineapple Juice Nutrition	Most common pineapple juice brand in database
Pomegranate Blueberry Acai Juice	Assume Pom Wonderful Pomegranate and Blueberry Juice	As per manufacturer website and Internet search
Prune Juice no brand	Assume Sunsweet	Most common brand for prune juice in database

V8 "Veggie Juice"	Assume Regular V8 Tomato juice	Most common brand for vegetable juice in database
V8 Fusion - flavor missing	Assume Strawberry banana	Most common V8 Fusion flavor in our database
Vegetable Juice with strange brand name or no brand name	Assume V8 vegetable juice	Most common brand for vegetable juice in database
Welch's flavor missing	Assume Grape	Most common flavor for Welch's
Welch's Mixed Berry	Does Not exist, assume Welch's White, grape, raspberry concentrate	Along with white, grape, cranberry - mixture that had the most "berries" in it. White, grape, cranberry/raspberry have the same sugar and calorie content per ounce
"Apple juice cocktail"	If no brand assume Honest Kids	As of June 2012, Honest Kids juices are not 100%; this was the only brand I could find that had apple juice cocktail with just apples, not grapes, cherries, etc.
"Fruit Punch"	Assume Hawaiian Punch	Most common fruit punch brand in our database
"Juice Box"	Assume Capri Sun fruit drink	Out of the most common fruit drinks, Capri Sun by far the most common: 294 entries; 2nd place: Kool Aid 100 entries
"Sparkling juice"	Assume Ocean Spray	First brand to come out with bevg
Blueberry Juice Drink	Ocean Spray Blueberry Juice Drink	Of the most common brand names in database, this is the only one that has blueberry juice
Brand nutrition not available	If "fruit juice" written, assume Minute Maid; if "juice drink" written assume Kool Aid	

Fruit Drink	Assumptions	Reason
Capri Sun juice drink no flavor listed	Doesn't matter what flavor you choose; all flavors have 16 g sugar and 60 cal per 6 ounces	As per manufacturer website
Capri Sun Roarin Waters no flavor listed	Doesn't matter what flavor you choose: all flavors have 8 g sugar and 30 cal per 6 ounces	As per manufacturer website
cranberry juice drink combinations	Assume Ocean Spray	Most common brand for cranberry juice and cranberry juice mixes
Diet Snapple when flavor is missing	Assume Diet Cranberry Raspberry	Almost all Snapple diet drinks have 0 g sugar, this one has 2 g sugar
Dole Fruit Punch Does not exist	Assume Hawaiian Punch	Hawaiian Punch is the most common fruit punch juice drink in database
flavor of juice not listed	Assume Fruit Punch	Most common non-diet flavor in our database and research found fruit punch was favorite juice drink among preK
Goya - no flavor listed	Assume guava	Most common non-diet flavor in our database
Goya Nectar - any flavor that has inconsistent search results for nutrition	use Goya Guava Nutrition info (28 g sugar, 7.1 oz, 140 calories)	Nutrition info not listed on website and very inconsistent on internet. Guava juice can label was available in store
Hi-C flavor not listed	Assume orange flavor	Orange is the most common flavor in our database
Homemade Lemonade	Use nutrition from Country Time liquid	Country Time lemonade mix is the most common brand for lemonade mix in database
Honest Kids - no flavor listed	Assume fruit punch	Most common non-diet flavor in our database
Juice Drink - no brand listed, but has flavor listed	Search and use Common brands with flavor listed - Ocean Spray, Minute Maid	
Just "Kool Aid" in group 6	Assume Jammers, fruit punch flavor	Jammers is more common than Kool Aid Bursts

Fruit Dinks	Assumptions	Reason
Kool aid - jammers or bursts not specified	Assume jammers	Jammers more representative of juice drink - don’t have sucralose
Kool Aid Goya	Does not exist; assume tropical punch flavor of Jammers	As per manufacturer website and Internet search
Lemonade (fluid)	When brand is missing, assume Simply Lemonade	Most common fluid lemonade in database
Mango flavor - brand not listed	Assume Mango Twist from Welch's	Only major brand that carries mango flavor
Maracuya juice	Passion Fruit - WELCHS	As per manufacturer website and Internet search for maracuya (Spanish for passion fruit)
Ocean Spray Lite/Diet Cranberry Juice	Assume juice Drink, contains High Fructose Corn Syrup	As per manufacturer website and ingredient list
Odwalla "green juice"	Assume original flavor (Superfood)	Only green juice in Odwalla inventory
Orange Drink - no brand	Assume Sunny D	Most common orange juice drink brand in database
Orange Pineapple Apple	Juice Drink Welch's	As per manufacturer website
Snapple when flavor is missing	Assume Fruit Punch	Most common non-diet flavor in our database
V8 Splash missing flavor	Assume berry blend	Most common flavor in database

DILUTED 100% juice	Assumptions	Reason
Fruitables no flavor listed	Assume strawberry kiwi	this flavor is the most common fruitable in our database

SYRUP - Drink and Pancake	Assumptions	Reason

Brand missing for choc/strawberry syrup	Assume Hershey's	Most common chocolate syrup brand in database
Pancake Syrup brand nutrition info not available	Assume Aunt Jemima	Most common brand name for pancake syrup in database
Vanilla Syrup	Assume Eclipse	Cannot find it under hershey's or Nesquik. Eclipse is a common New England brand (from Rhode Island)
When chocolate syrup and strawberry syrup are together	Take average of sugar, serving size, and calories	

Soda	**Assumptions**	**Reason**
"Soda" no flavor listed	Assume Coca Cola	Most common soda brand and flavor in database
grape soda - no brand	Assume Fanta	Most common grape soda brand in our database
Orange Soda no brand	Assume Sunkist	Most common orange soda brand in database

Juice Drink Powder	**Assumptions**	**Reason**
"Drink mix powder" "Drink powder" no flavor	Assume Crystal Light type drink	
"Drink mix powder" but with juice flavor	Assume Kool Aid with sugar already added	Kool Aid most common juice drink powder brand in database
"Kool Aid Pouches" "Packets" "Envelopes" etc	Assume the powder with NO sugar in it	As per manufacturer website and Internet search for Kool Aid packets
"Kool Aid Powder"	Assume the powder with sugar already in it	Most common type of juice drink mix of Kool Aid in our database

Crystal Light	Not using this data	
Kool Aid that requires Sugar	Requires 1 cup sugar (200 g) per 2 qts (64 oz) 800 calories in 1 cup sugar so, 25 g sugar per 8 ounces 100 calories	As per manufacturer directions and sugar from calories on USDA website
Lemonade on the go mix	Assume Country Time (35 calories, 9 g sugar)	Country Time most common brand for lemonade mix in database
Powder on the go - no flavor or brand	Assume Kool Aid	Most common " on the go " brand in data base
Wyler's Light	No data needed, similar to Crystal Light	Generic brand of Crystal Light

Iced Tea Fluid	**Assumptions**	**Reason**
Homemade Sweet Tea	Use Lipton FLUID nutrition	Lipton most common brand for sweet tea
Lemon Ice Tea	Assume Lipton 100% natural ice tea with lemon (13 g sugar)	Lipton most common brand for iced tea
Snapple Ice tea	Snapple Ice Tea - assume lemon ice tea	As per manufacturer website
Sweet tea - no brand listed	Assume Lipton FLUID (23 g sugar)	As per manufacturer website and from database/participant details

Energy Drinks	**Assumptions**	**Reason**
Gatorade Powder	Assume nutrition of pre-mixed beverage	

Diluted 100% Juice	**Assumptions**	**Reason**
No Sugar Apple Juice	Does not exist. Use Nutrition Information for Reduced Sugar Apple Juice	As per Internet search
Ocean Spray Lite Cranberry	Categorize as juice drink - ingredients show high	As per manufacturer website and Internet

Juice	fructose corn syrup	search
Reduced Sugar Apple Juice	Use Walmart Lite Apple Juice	Only reduced sugar apple juice brand in our database

Figure A1. Frankfurt protocol for child height measurement.

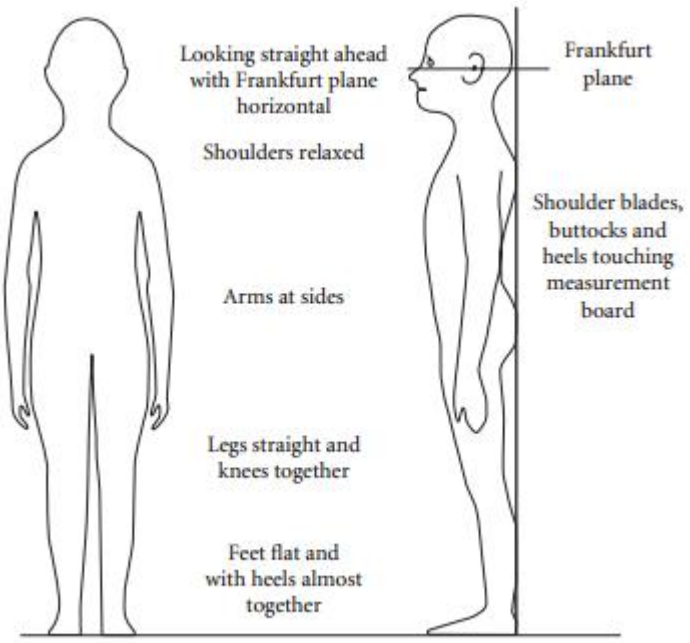

Table A2. Initial exploration of raw data for household beverage availability, in ounces, and results from the 4% trim

	Mean Beverage Availability (oz)	Standard Deviation	Skewness	Kurtosis
Pre-Trim	868.47	830.65	3.63	22.74
Post-Trim	804.85	582.09	1.43	1.78

Table A3. Pre and Post log transformation summary data[a] for sugar sweetened beverages[b].

				Kolmogorov-Smirnova		
		Skewness	Kurtosis	Statistic	df	Sig.
Available in household	Pre Log Ounces	4.431±0.122	33.180	0.241	403	<0.0001
	Post Log Ounces	-1.313±0.122	2.780±0.243	0.104	402	<0.0001
Consumed per day by the preschool child	Pre Log Ounces	2.775±0.122	13.58±0.243	0.203	403	<0.0001
	Post Log Ounces	-.276±0.122	-1.048±0.243	0.107	403	<0.0001
	Pre Log Calories	1.437±0.128	1.786±0.254	0.163	366	<0.0001
	Post Log Calories	-.994±0.128	.730±0.254	0.121	366	<0.0001
	Pre Log Sugar (g)	1.552±0.128	2.428±0.254	0.163	366	<0.0001
	Post Log Sugar (g)	-0.609±0.128	-.364±0.254	0.091	366	<0.0001

[a]All data was trimmed 4%, pre log transformation, to normalize.
[b]Sugar sweetened beverages are any fluid ounce beverage that have added real or artificial sugar.

Table A4: Pre and post log transformation summary data[a] of 100% fruit juice

				Kolmogorov-Smirnova		
		Skewness	Kurtosis	Statistic	df	Sig.
Available in household	Pre Log Ounces	4.840±0.126	37.184±.251	0.186	377	<0.0001
	Post Log Ounces	-0.446±0.126	1.051±0.251	0.118	377	<0.0001
Consumed per day by the preschool child	Pre Log Ounces	1.930±0.126	5.151±0.251	0.146	377	<0.0001
	Post Log Ounces	-0.479±0.126	0.026±0.251	0.074	377	<0.0001
	Pre Log Calories	2.021±0.127	5.560±0.254	0.144	367	<0.0001
	Post Log Calories	-1.22±0.127	2.958±0.254	0.085	367	<0.0001
	Pre Log Sugar (g)	2.004±0.127	5.444±0.254	0.14	367	<0.0001
	Post Log Sugar (g)	-0.626±0.127	0.513±0.254	0.068	367	<0.0001

[a]All data was trimmed 4%, pre log transformation, to normalize.

Figure A2. Stem and leaf plot of pre-log and post-log transform total household availability in ounces of sugar sweetened beverages[a]

Pre Log Transform: Total ounces available in the household of sugar sweetened beverages

```
  88.00       0 .
00000000000000000111111222222222233333344444444455566666666666666666666667777888889999
9
  66.00       1 .  000001111122222222222222333333334444445555555556666777888999999999
  59.00       2 .  00000111112223334444444445555555555555556666666667788888888
  32.00       3 .  11222222223333344555566778888999
  32.00       4 .  00000222222333345555667888999999
  21.00       5 .  001112233446666677899
  12.00       6 .  013444455679
   8.00       7 .  00135677
   5.00       8 .  14679
  13.00       9 .  0011345666899
  10.00      10 .  0012224999
  10.00      11 .  0011255668
   2.00      12 .  78
   8.00      13 .  00136789
   1.00      14 .  0

      36.00 Extremes    (>=1488)
     Stem width:     100.0
     Each leaf:       1 case(s)
```

Post Log Transform: Total ounces available in the household of sugar sweetened beverages

```
    4.00       1 .  1111
   12.00       1 .  223333333333
    6.00       1 .  555555
   14.00       1 .  66666666667777
   35.00       1 .  88888888888888888888888899999999999
   47.00       2 .  00000000000011111111111111111111111111111111111
   44.00       2 .  22222222222222222233333333333333333333333333
   65.00       2 .
44444444444444444444444444444444455555555555555555555555555555
   56.00       2 .  66666666666666666666666666666667777777777777777777777
   36.00       2 .  88888888888888888899999999999999999
   35.00       3 .  00000000000000000000111111111111111
   23.00       3 .  22222222222222233333333
    6.00       3 .  444455
    2.00       3 .  66

17.00 Extremes    (=<1.0)
Stem width:      1.00
Each leaf:       1 case(s)
```

[a]Sugar sweetened beverages are any fluid ounce beverage that have added real or artificial sugar.

Figure A3. Stem and leaf plot of pre-log and post-log transform of SSB ounces per day data.

Pre Log Transform: Total ounces consumed per day of sugar sweetened beverages[a] by the preschool child, as recorded by caretaker

```
155.00       0 .
00000000000000000000000000000000000000000000011111111111222222333333444444444
  65.00      0 .  55555566666666666677788888899
  52.00      1 .  00001122222222222333334444
  46.00      1 .  555566666666777888999
  30.00      2 .  0012334444444
  17.00      2 .  6688899&
  10.00      3 .  0124
   8.00      3 .  5667
   3.00      4 .  00

 17.00 Extremes    (>=47)
 Stem width:      10.0
 Each leaf:       2 case(s)
```

Post Log Transform: Total ounces consumed per day of sugar sweetened beverages by the preschool child, as recorded by caretaker

```
  81.00       0 .
000000000000000000000000000000000000000000000000000000000000000000000000000001111111111
  21.00       0 .  222222223333333333
  22.00       0 .  444444444445555555555
  38.00       0 .  66666666666666666677777777777777777777
  53.00       0 .  88888888888888888888888888888899999999999999999999999
  56.00       1 .  00000000000000001111111111111111111111111111111111111111
  72.00       1 .
22222222222222222222222222222222222223333333333333333333333333333333333333
  40.00       1 .  44444444444444444444444555555555555555555
  17.00       1 .  66666666777777777
   1.00       1 .  8
   2.00       2 .  01

 Stem width:      1.00
 Each leaf:       1 case(s)
```

[a]Sugar sweetened beverages are any fluid ounce beverage that have added real or artificial sugar

Figure A4. Stem and leaf plot of pre-log and post-log transform total household availability in ounces of 100% fruit juice.

Pre Log Transform: Total ounces available in the household of 100% fruit juice

```
   32.00       0 .  00001111122222233333333334444444
   75.00       0 .
555566666666666666666666666666666666666666666666677777888888899999999999
   76.00       1 .
000111222222222222222222222222222222222222222222222222222223333444444444
   52.00       1 .  55555666666666666677788888999999999999999999999999
   21.00       2 .  000122222333333444444
   40.00       2 .  55555555555555555555555556666788888999
   18.00       3 .  002222222222223444
   25.00       3 .  5555556666677888888888888
    7.00       4 .  0022444
    4.00         4 .  5778
   27.00 Extremes    (>=512)
  Stem width:      100
  Each leaf:       1 case(s)
```

Post Log Transform: Total ounces available in the household of 100% fruit juice available

```
    2.00      12 .  77
    3.00      13 .  229
    3.00      14 .  244
   10.00      15 .  1111113346
    7.00      16 .  1157779
    6.00      17 .  155788
   50.00      18 .  11111111111111111111111111111111111111111123356789
   19.00      19 .  1144555566668888899
    8.00      20 .  02345799
   72.00      21 .
111111111111111111111111111111111111111111111111111113334556666778889
   46.00      22 .  000000000111122345667778888888888888888888899
   23.00      23 .  00112355556677777888889
   42.00      24 .  000000000000000000000000011222335566666688
   41.00      25 .  000000000111233444555555666778888888888888
   11.00      26 .  00224555778
   11.00      27 .  11111125568
    7.00      28 .  0000025
    5.00      29 .  01788
    1.00      30 .  4

3.00 Extremes    (>=3.11)
 Stem width:      .10
 Each leaf:       1 case(s)
```

Figure A5. Stem and leaf plot of pre-log and post-log transform of 100% fruit juice total ounces consumed.

Pre Log Transform: Total ounces consumed per day of 100% fruit juice by the preschool child, as recorded by caretaker

```
  41.00       0 .  00000000000000001111111111111111111111111
  27.00       0 .  222222222222233333333333333
  47.00       0 .  44444444444444444444444444445555555555555555555
  26.00       0 .  66666666666666666777777777
  38.00       0 .  88888888888888888888888888899999999999
  20.00       1 .  00000000000001111111
  33.00       1 .  22222222222222223333333333333333
  21.00       1 .  444444444455555555555
  28.00       1 .  66666666666666666666777777777
   8.00       1 .  88888999
  15.00       2 .  000000000001111
   7.00       2 .  2222222
  22.00       2 .  4444444444444444444455
   4.00       2 .  6667
   3.00       2 .  889
   5.00       3 .  00000
   5.00       3 .  22222
   3.00       3 .  445
   4.00       3 .  6666
   1.00       3 .  8

  19.00 Extremes    (>=40)
  Stem width:       10
  Each leaf:       1 case(s)
```

Post Log Transform: Total ounces consumed per day of 100% fruit juice by the preschool child, as recorded by caretaker

```
  13.00       0 .  0000000000004
   1.00       1 .  5
   2.00       2 .  33
  12.00       3 .  013335588888
  16.00       4 .  3333333344466799
  10.00       5 .  1111134458
  30.00       6 .  00244467778888999999999999999
  26.00       7 .  11112222244466777777777778
  22.00       8 .  2223444444444888888889
  36.00       9 .  000002344555555555555555555556889
  31.00      10 .  00000011124444444556677788899
  42.00      11 .  11111111111114444556666666666677777777899
  45.00      12 .  000000000001333333333333333333355566667777899
  40.00      13 .  01122222222334555667777799999999999999
  18.00      14 .  000111333446679999
  14.00      15 .  01111245566679
  11.00      16 .  11113359999
   4.00      17 .  2448
   3.00      18 .  156
   1.00      19 .  0

  Stem width:       .10
  Each leaf:       1 case(s)
```

APPENDIX B

RESEARCH INSTRUMENTS

First Demographic Survey

1. What is your birth day (month, day, year)? _____
2. What is your child's birthday (month, day, year)? _____
    a. What is the birthday of your youngest child (month, day, year)? _____
3. Where were you born? _____
    a. If not in US, year moved to US? _____
    b. What town do you live in now? _____
    c. When did you move to (current town)? _____ (year)
4. How long have you lived at your current address?_____
5. How would you describe your ethnicity? (If questioned, list categories below. Check all that apply)
    a. African American/Black_____ d. White_____
    b. Latino_____ e. Other_____
    c. West Indian_____
6. 6. Are you pregnant? _____ yes _____ no

7. Are you currently breastfeeding? _____ yes _____ no

8. How would you describe your living situation?
    a. Single ____ d. Divorced_____
    b. Partnered ___ e. Separated____
    c. Married ____ f. Widowed ____

9. How many people live in your household, including yourself? _____
   # adults (> 18 years old) _____

10. How many children over 5 y live in your house?_____

11. What is the highest grade of school you completed? _____

12. Do you currently have health insurance? _____yes _____no
    If yes, what type?
    a. Medicaid _____
    b. Medicare _____
    c. Other? _____

13. Are you currently employed? _____yes _____no
    If yes,
    a. full-time _____
    b. part-time _____

14. Are you currently receiving WIC? ☐ Yes – go to #16 ☐ No

15. Have you ever received WIC? ☐ Yes ☐ No

16. Are you currently receiving food stamps? ☐Yes –go to #18 ☐ No

17. Have you ever received food stamps? ☐ Yes ☐ No

18. Who else give your child something to drink at least once a day?

    _____

19. Does anyone else buy drinks for your household? Yes_____ No_____

    If yes, who else buys drink for your household?_____

20. Interviewer: please mark based on observation:

    Gender: Male _____ Female_____

21. What is your child's gender?

    Gender: Male _____ Female_____

Food Insecurity / Hunger Survey

(Adapted from Food Security / Hunger Core Module, 3-Stage Design, with Screeners: USDA, FCS: 2/20/97)

Now I'm going to read you several statements that people have made about their food situation. For these statements, please tell me whether the statement was OFTEN true, SOMETIMES true, or NEVER true for your household in the last 12 months, that is, since last (name of current month).

	Often True	Sometimes True	Never True	Refuse
2. The first statement is "We worried whether our food would run out before we got money to buy more."	☐	☐	☐	☐
3. "The food that we bought just didn't last, and we didn't have money to get more."	☐	☐	☐	☐
4. "We couldn't afford to eat balanced meals." **[If needed: Probe: We couldn't eat a variety of foods, we used the same foods over and over.]**	☐	☐	☐	☐

	Often True	Sometimes True	Never True	DK Refuse
5. "We relied on only a few kinds of low-cost food to feed my/our child/the children because we were running out of money to buy food."	☐	☐	☐	☐
6. "We couldn't feed my/our child/the children a balanced meal, because we couldn't afford that."	☐	☐	☐	☐
7. "(My child was/ My children were) not eating enough because we just couldn't afford enough food."	☐	☐	☐	☐

Stage Two: Questions 8-12 [INTERVIEWER: If "often true" or "sometimes true" <u>to any one</u> of Questions 2-7, then continue to Q8; otherwise, thank respondent for participating.]

8. In the last 12 months, since last (name of current month), did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?

☐ Yes ☐ No (Go to Q9) ☐ DK/Refused (Go to Q9)

8a. **[IF YES to Q8, ASK]** How often did this happen - almost every month, some months but not every month, or in only 1 or 2 months?

☐ Almost every month ☐ Only 1 or 2 months

☐ Some months but not very month ☐ DK/Refused

	Yes	No	DK/ Refused
9. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?	☐	☐	☐
10. In the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food?	☐	☐	☐
11. In the last 12 months, did you lose weight because you didn't have enough money for food?	☐	☐	☐

12. In the last 12 months, did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?

☐ Yes ☐ No (Skip Q12a) ☐ DK/Refused (Skip Q12a)

12a. **[IF YES to Q12, ASK]** How often did this happen - almost every month, some months but not every month, or in only 1 or 2 months?

☐ Almost every month ☐ Only 1 or 2 months

☐ Some months but not very month ☐ DK/Refused

Stage Three: Questions 13-16 [INTERVIEWER: <u>If affirmative response to any one</u> of Questions 8-12, then continue to Q13; otherwise, thank respondent for participating.]

13. The next questions are about children living in the household who are under 18 years old.
In the last 12 months, since (current month) of last year, did you ever cut the size of (your child/any of the children's) meals because there wasn't enough money for food?

☐ Yes ☐ No ☐ DK/Refused

14. In the last 12 months, did any of the children ever skip meals because there wasn't enough money for food?

☐ Yes ☐ No (Skip Q14a) ☐ DK/Refused (Skip Q14a)

14a. **[IF YES to Q14, ASK]** How often did this happen - almost every month, some months but not every month, or in only 1 or 2 months?

☐ Almost every month ☐ Only 1 or 2 months

☐ Some months but not very month ☐ DK/Refused

	Yes	No	DK/ Refused
15. In the last 12 months, (was your child/were the children) ever hungry but you just couldn't afford more food?	☐	☐	☐
16. In the last 12 months, did (your child/any of the children) ever not eat for a whole day because there wasn't enough money for food?	☐	☐	☐

Thank you very much for taking the time to answer these questions.

Participant ID

UConn Husky Byte
What's to Drink in Your Home?

SAMPLE - Drinks in Your Home

Participant #: _____

We want you to write down all the drinks in your home.

Drink/Syrup Name: Examples- Diet Coke Black Cherry Vanilla Goya Guava Nectar Capri Sun Fruit Punch	**Type:** Examples- Soda Juice drink 100% juice Milk Water Syrups	**Size:** Examples – 36 oz. bottle 8.75 juice box 12 fl oz. can	**Number:** How many containers do you have?	**How much:** How much does your child drink at meals? Frequency Amount (times/d)		**How does your child drink it?** Examples: Mixed with water Without mixing it with water	**Who drinks it?** Check what applies Mother Child	
Juicy Juice-grape	100% juice	6.75 fl oz box	1					
Welchito Grape Juice	Juice Drink	7.5 fl oz can	6					

Diet Coke Black Cherry Vanilla	Soda	2 L bottle	1					
Goya Guava Nectar	Nectar/Juice Drink	12 fl oz can	5					
Kool Aid Great Bluedini	Soft Drink	0.17 oz powder	1					
Nestle Strawberry Syrup	Syrup	16 oz bottle	1					

Look in your:

- ✓ **Fridge**
- ✓ **Counters**
- ✓ **Freezer**
- ✓ **Cupboards**
- ✓ **Pantry**
- ✓ **Cabinets**
- ✓ **Closets**
- ✓ **Anywhere else you would store drinks**

Drinks in Your Home
We want you to write down all the drinks in your home.

Participant #: _____

Drink/Syrup Name: Examples- Diet Coke Black Cherry Vanilla Goya Guava Nectar Capri Sun Fruit Punch	**Type:** Examples- Soda Juice drink 100% juice Milk Water Syrups	**Size:** Examples – 36 oz. bottle 8.75 juice box 12 fl oz. can	**Number:** How many containers do you have?	**How much:** How much does your child drink at meals? Frequency Amount (times/d)		**How does your child drink it?** Examples: Mixed with water Without mixing it with water	**Who drinks it?** Check what applies Mother Child	